HUGHES

Article IV - 3A

PRESHIPMENT REVIEW DATA PACKAGE PART B

FLIGHT MODEL VOLUME II - SUBSYSTEM DATA

MAY 1563 NASA STI FACILITY

BEST AVAILABLE COPY

Prepared for GODDARD SPACE FLIGHT CENTER Greenbelt, Maryland 20771 CONTRACT NAS 5-24200

REMATIC MAPPER

Research Center) 287 p HC A13/MF A01 CSCL 14B G3/43

Unclas 00259

PART B: SUBSYSTEM DATA (Santa Barbara

(E83-10259) THEMATIC MAPPER FLIGHT MODEL PRESHIPMENT REVIEW DATA PACKAGE, VOLUME 2, N83-26128

THEMATIC MAPPER

SEPT 1982

HS 236-0019-1679



Proposed for GOODAHO SPACE FLIGHT CENTER Greenheit, Maryland 20771 CONTRACT MAS 5-24200

**SEPT 1982** 

FLIGHT MODEL PRESHIPMENT REVIEW DATA PACKAGE VOLUME II - SUESYSTEM DATA PART B

Article IV - 3A

HUGHES HUGHES AIRCRAFT COMPANY ACE AND COMMUNICATIONS GROUP

Hushes Ref No. 04595 -



THE RESERVE OF THE PROPERTY OF

THEMATIC MAPPER

FLIGHT MODEL

PRESHIPMENT REVIEW

VOLUME II

SUBSYSTEMS

#### TABLE OF CONTENTS

		ection
1.0	INTRODUCTION	1.0
2.0	SUBSYSTEMS ACCEPTANCE DATA	
·	Multiplexer Assembly	2.1
	Multiplexer Summarized Performance	2.1.1
	Multiplexer Acceptance Data	2.1.2
	Scan Mirror Assembly	2.2
	Scan Mirror Summary Performance	2.2.1
	Scan Mirror Acceptance Data	2.2.2
	Power Supply Assembly	2.3
	Power Supply Summarized Performance	2.3.1
	Power Supply Acceptance Data	2.3.2
	Mainframe/Top Mechanical Assembly	2.4
	Mainframe/Top Mechanical Summarized Performance	2.4.1
	Mainframe/Top Mechanical Acceptance Data	2.4.2
	Aft Optics Assembly	2.5
	Aft Optics Summarized Performance	2.5.1
	Aft Optics Acceptance Data	2.5.2
	Focal Plane Assembly	2.6
	Focal Plane Summarized Performance	2.6.1
	Focal Plane Acceptance Data	2.6.2
	Radiative Cooler	2.7
	Radiative Cooler Summarized Performance	2.7.1
	Radiative Cooler Acceptance Data	2.7.2

#### THEMATIC MAPPER

FLIGHT MOTEL

#### PRE SHIPMENT REVIEW

VOLUME II

SUBSYSTEMS

#### TABLE OF CONTENTS

(Continued...)

	•
Radiative Cooler Door Assembly	2.8
Radiative Cooler Door Summarized Performance	2.8.1
Radiative Cooler Door Acceptance Data	2.8.2
Top Optical Assembly	2.9
Top Optical Summarized Performance	2.9.1
Top Optical Acceptance Data	2.9.2
Telescope Assembly	2.10
Telescope Summarized Performance	2.10.1
Telescope Acceptance Data	2.10.2
Relay Optics	2.11
Relay Summarized Performance	2.11.1
Relay Acceptance Data	2.11.2
Electronics Module	2.12
Electronics Summarized Performance	2.12.1
Electronics Acceptance Data	2.12.2
Cable Harness	2.13
Cable Harness Summarized Performance	2.13.1
Cable Harness Acceptance Data	2.13.2

#### 2.0 Subsystems Acceptance Data

Each of the major subsystems of the Flight Model Thematic Mapper was reviewed as an entity prior to integration into the system. The intent of this section is to present for each major subsystem, acceptance data for the subsystem (test results); reference lists of the configuration status; and reference lists of Non-Conforming Material Reports, Failure Reports (with copies), and Requests for Deviation/Waiver (with copies).

The acceptance data for each subsystem (where applicable) is contained in the Appendix to this report, as referenced in the first subsection for each subsystem.

The second subsection for each subsystem contains a tabular summary of the "as designed" and "as built" configuration lists, showing all applicable drawings, specifications, or standards.

(An "as built" configuration list for the total system is included in Volume I and is also included herein immediately following this page). This is followed by a listing of all items against the subsystem, with copies of NCRM's, RT's, and RD/W's.

SUMMARY
AS-BUILT CONFIGURATION LIST
TM FLIGHT S/N 003

LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCÉPT. REVISION	AS-BUILT REVISION	SERTAI NUMBEI
1	51065	THEMATIC MAPPER ASSY	J	J	J	003
-	31003	INEMATIC MATTER ASSI	4257A	4257A	4257A	נטט
•			4487A	4487A	4487A	• • • • • • • • • • • • • • • • • • • •
•	•		4557A	4557A	4557A	* *
·			4573A	4573A	4573A	
	,		4643A	4643A	4643A	
	:		4658A	4658A	4658A	
			D143R1	D143R1	D143R1	
			D144	D144	D144	
	•		D146	D146		•
			D148	D148	D148 7 3	<u> </u>
			D155	D155	D146 D148 D155 D158 D161	<u> </u>
			D158	D158	D158 💆 🕏 🕏	5
4			D161	D161	D161 20 F	<u>.</u>
	*.		D162	D162	D162 Q1	<b>0</b>
•			D163	D163	D163 💆	
			D164	D164	D164 = =	
			D165	D165		Ø
			W166	W166	W166	
			W169	W169	W169	
			W170	W170	W170	$r_{\rm c} = r_{\rm c}$
			W171R1	W171R1	W171R1	
			W173	W173	W173	•
2	50840	MAIN FRAME ASSY	E	E	E	003
						(
2 .	52347	ELECTRONICS MODULE ASSY	D	В	В	201
			4588A	4091A	4091A	,
				4113A	4113A	
				4242A	4242A	
				4293A	4293A	

PART HO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUTET REVISION	SER Numi
3533003-100	MULTIPLEXER ASSY	C	С	с	00.3
		43009	43074	43009	
		43074	65661	43074	
		65661	65662	65661	* .
		65662	W124	65662	
		W124	W125	W124	
		W125		W125	
50869	POWER SUPPLY ASSY	<b>D</b>	D	b	004
		2015A	2015A	20151	
		2039A	2039A	2039A	
		4347A	4347A	4347A	
		D030	D030	0030	
		D068	D068	D068	
•		W074	W074	W074	
		W092	W092	W092	
•		W093	W093	W093	
•		W101	W101	W101	
52348	CABLE ROUTING ASSY	F	F	F	00
32340		3844A	3844A	3844A	
52532	OPTICAL ASSY	F	F	F	00:
32332	OFIICAL ASSI	3174A	3174A	3174A	•
		4100A	4100A	4100A	
· ·		4187A	4187A	4187A	00
		4266A	4266A	4266A	ORIGINAL OF POOR
		4488A	4488A	4488A	B≅
		4559A	4559A	4559A	ŏ≨
		4656A	4656A	4656A	2017
		D-151	D-151	D-151	PA D
		D-154	D-154	D-154	PR.
		W-148	W-148	W-148	PAGE IS
61610	AFT OPTICS ASSY	<b>E</b> 1	. <b>D</b>	D	00
51512	WIT OLITCO WOOT	3646A	3646A	3646A	,
		3925A	3896A	3896A	
		3959A	3925A	1925A	
		4585A	3959A	39598	

ND /L	PART NO			NOMENCLATURE		CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERTAI NUMBEI
4	50795			PRINE FOCAL PLANE ASSY	•	J	11		201
•	30793			FRIME FOCAL FLANE ASSI		W126	3934A	3934A	
•				•	•	WILU	3968A	3968A	
							3982A	3982A	
	4						W126	W126	
	•				•			_	
	51200			RADIATIVE COOLER ASSY	•	E	E	E	003
						3922A	3922A	3922A	
						4201A	4201A	4201A	
						4216A	4216A	4216A	
					•	4269A	4269A	4269A	
						SB-W032	SB-W032	SB-W032	,
		•		•	• :	W144	W144	W144	• • • • • • • • • • • • • • • • • • • •
		•				W147	W147	W147	
		*				W149	W149	W149	
						W151	W151	W151	
	50973			COLD FOCAL PLANE ASSY		В	<b>B</b>	В	201
	307.0					2870A	2870A	2870A	
				er er	•	3895A	3895A	3895A	
					•	4173A	4173A	4173A	
						SB-D004	SB-D004	SB-D004	
						W102R1	W102R1	W102R1	
						W109	W109	W109	
					<b>Q Q</b>	W111	W111	W111	•
					51 O	W134	W134	W134	
					ORIGINAL OF POOR	W135	W135	W135	•
•	51337			TELESCOPE ASSY		D	D	D	002
			. ,		Ä	3866A	3866A	3866A	
		* -			PAGE	3917A	3917A	39174	
		•			T B	W129	W129	W129	
	•				<b>~</b> 00	W136	W136	W136	, ,
			• •						

Ď L	PART HO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-DUTLT REVISION	SERT NUMB
	52534	RELAY OPTICS ASSY	D 1145A 4097A	D 1145A 4097A		003
	3533002-100	SCAN HIRROR ASSY	E	D 13121 13122 64358 64363 64369 64374 W020	D 13121 13122 64358 64363 64369 64374 WO20	004

of poor quality

SECTION 2.6
FOCAL PLANE ASSEMBLIES

Section 2.6.1

Focal Plane Assemblies
Performance Data

The acceptance performance (test) data for the Focal Plane Assemblies is contained in Appendix D of this report (Vol. IV, Part D).

2.6.2 Acceptance Data

2.6.2.1 Configuration Lists

The "as built" configuration list for the Cooled and for the overall system.

#### AS-BUILT CONFIGURATION LIST

COLD FOCAL PLANE ASSY

P/N 50973, S/N 201, FLIGHT

					∵r/N 50973,	, S/N 201, 1	CLIGHT
ND VL	PART NO.		NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
1	50973		COLD FOCAL PLANE/COOLER CABLE ASSY	B + 2870A 3895A	B + 2870A 3895A	B + 2870A 3895A	201
			ବ ନ	SB-D004 W-102R1	SB-D004	SB-D004	
÷			ORIGINAL OF POOR	₩-109	W-109	W-109	
			9.2	W-1114			k .
			QUALI	₩-134 ₩-132 4173Δ	W-135		• •
?	50955		COOLED FOCAL PLANE/COLD- FINGER ASSY	•	E + 2444A 3121A	E + 2444A 3121A	201
3	50356		SUBSTRATE, COLD FOCAL PLANE		c + W-142		013
3	50958		DETECTOR ARRAY, BANDS 5 & 7	B + W-1224	B + W-122		
					W-132	W-132	
				W-133	W-133	W-133	
ŀ	50959	•	DETECTOR ARRAY, BAND 6	В	В	<b>B</b>	120
i	50948		PRINTED WIRING BOARD, DISTRIBUTION	<b>B</b>	A + 6895 8161	A + 6895 8161	201
	50970		FLEXIBLE PRINTED WIRING ASSY, COOLER CABLE BAND 5	C	B + 9015 9645	B + 9015 9645	102
,					2198A	2198A	
	50974		FLEXIBLE PRINTED WIRING ASSY, COOLER CABLE BAND 6.	D	C + 9647 2199A	C + 9647 2199A	103
	50992		FLEXIBLE PRINTED WIRING ASSY, COOLER CABLE BAND 7	<b>C</b>	B + 9646 2200A	B + 9646 2200A	201

<sup>\*</sup> Indicates waiver is active but no longer applicable to the hardware presently being used on this unit.

D L	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
;	51393	FLEXIBLE PRINTED WIRING ASSY, CABLE HEATER & SENSOR	C + 3941A	B + 9648 22G1A 3941A	B + 9648 2201A 3941A	103
: :	51750	CLAMP, CAPLE, INNER-HEATER & SENSOR	<b>B</b>	<b>B</b>	В	
:	51751	CLAMP, CABLE, MIDDLE-HEATER & SENSOR	В	В	В	
. !	51752	CLAMP, CABLE, INNER-BAND 567	В	В	В	
	51753	CLAMP, CABLE, MIDDLE AND OUTER-BANDS 5 & 7	<b>B</b>	<b>B</b>	. <b>B</b>	
2	51754	CLAMP, CABLE, INNER-BAND 6	В	В	В	
2	51755	CLAMP, CABLE, MIDDLE AND OUTER-BATD 6	<b>B</b>	В	В	
2	51766	CLAMP, CABLE, OUTER-HEATER & SENSOR	В	. <b>A</b>	В	

Quality Assurance

Dorrara 3/10/82

Configuration Management Office

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#### AS-BUILT CONFIGURATION LIST

PRIME FOCAL PLANE ASSY
P/N 50795, S/N 201, FLIGHT

IND LVL	PART NO.		NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISOON	SERTAL NUMBER
1	50795		SILICON FOCAL PLANE ASSY	H + 3934A 3968A 3982A	3968A	H + 3934A 3968A 3982A	•
2	50797		SILICON DETECTOR & PREAMP ASSY-BAND 2	W-126 E + W115	W-126 E + W115		
2	50797		SILICON DETECTOR & PREAMP ASSY-BAND 3	E + W112 W116	E + W112 W116	E + W112 W116	401
2	50797-1		SILICON DETECTOR & PREAMP ASSY-BAND 1	E + W123	E + W123	E + W123	401
2	50797-1		SILICON DETECTOR & PREAMP ASSY-BAND 4	E + W114 W117 W118	E + W114 W117 W118	E + W114 W117 W118	401
3	51015		SILICON PREAMP ASSY	D + 2950A	D + 2950A	D + 2950A	103 203 207 209
3	51015-1		SILICON PREAMP ASSY (S/N 2	D + 2950A 07-1) W119	D + 2950A W119	D + 2950A W119	102-1 206-1 207-1 207-1
4	50799-1		SUBSTRATE ASSY, SILICON PREAMP FIRST STAGE	C	C	ORIGINAL OF POOR	018 027 035 043
4	50799-2		SUBSTRATE ASSY, SILICON PREAMP FIRST STAGE	c	c	JAL PAGE IS OR QUALITY	010 016 030 024
•		•			•	≺ ಔ	

Page 2 P/N 50795

•		•				the second secon	• •	
PART NO.		NOMENCLATURE			CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
	·							
50807		LED SOURCE, SILICON PLANE ASSY	FOCAL	H	+ D027	H + D027	H - D027	201

S. H. Branda 12-18-81

Quality Assurance

Jerg ara

12-18-81

Configuration Data Management Office

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PRIME FOCAL PLANE ASSEMBLY

Listing of Liens

## FOCAL PLANE ASSEMBLIES PRIME FOCAL PLANE ASSEMBLIES

F	ail	ure	Re	ports	Number

Failure Repor	ts Number .
Open	Closed
·	· ·
• •	F0527
	F0560
* **	F0581
	· F0620
	F1717
	F2240
	F2241
	F2662
	F2663
	F2666
	F2668
	F2669
	S8014
	S8058
	S8201
	S8202
	S8206(Spare)
	S8211(Spare)
	S8212(Spare)
	S8227
·	S8228(Spare)
	S8229
·	S8231(Spare)
	S8317
	S8318
·	S8322
٠.,	S8323
	S8324
2	S8330
ı	S8341
	S8342
,	S8401(Spare)
	S8440
	· · · -

Deviations	Waivers
D-128 D-142	W-112 W-114 W-115
	W-115 W-116 W-117 W-119 W-120 W-126
	W-143 W-148 W-154 W-155 W-157
	W-158

PRIME FOCAL PLANE ASSY.

#### P/N 50795

FLIGHT	1
Failure	Report
No.	

#### PROTOFLIGHT Failure Report No.

ENGINEER
Failure Report
No.

Open	Closed	Open	Closed		Open	Closed
	F0527		F0561	S8016	,	F1766
	F0560		F0569	S8017		F2697
	F0581		F0570	S8019		
	F0620		F0596	S8020		
	F1717	· .	F0609	\$8039		
,	F2240		F0611	S8040		
	F2241		F0612	S8041		
	F2262		F0613	S8053		
	F2263		F1702	S8054	1	
	F2666		F1706	S8055		
	F2668		F1721	\$8056		
•	F2669		F1723	S8059		1
	S8014		F1724	S8060		
	58058		F1752	S8062	1 1	ı
	S8201		F1768	S8063		
	S8202		F1771	£8065	<b>!</b>	
	S8206(Spare)		F1784	S8066		•
	S8211(Spare)		F1785	S8067	1	
	S8212(Spare)		F1786	£9070	·	
	S8227		F1790	S8071		
	\$8228(Spare)		F1795	\$8072	] ]	
•	S8229		F1798	S8077	1	
	S8231(Spare)		F1.799	S8078		
	S8317		F1800	\$8079		
	\$8318	·	F2388			
	58322		F2389			
	58323		F2390			
	S8324		F2648			
	\$8330		F2673		1	
	S8341	:	F2674			
	S8342		F2712			
	S8401(Spare)	, ,	F2796	*		
	S8440	}	S8000			•
			S8001			
			S8002		·	
			S8003			
	•		S8004		ĺ	



#### HUGHES

HUGHES AIRCRAFT COMPANY

### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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- ]		EQUIPMENT (DENY	PREATION		***************************************	ecc0		Ţ	PERTINES IN	2.69	ati	e Pactura
1		7. EMERAGICA	CADICI	ve ter				-				
-		Q 1227	LIME	France	PLANE	*			0795			
		8. AGSSECOLY	C entrette	#GLY							1	
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- 1	ğ	Aride	GASALLO	<u></u>	M. C. A.P.	at 1800	Pares		attacked L		<u> </u>	
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- 1	3	APPLIE		<u> </u>	30141.				CONTINUE SHEET V	A LOS	a 10-	5-79
	3	CORRECTIVE A	LEHRNTING CTION	_				_	_//A	11/200	Ý	
<u> </u>	3	34 BASIC CAUSE OF VERIFIED FAILURE		12 OBEIGN		TEST COLUP.		PO. PROCED	une yaylo	200	UNKN	
ノ	ž	FAILURS		ENVIRORMEN  DEFECTIVE P		TEST PROC.		edy/pas eri Chilmanen		ufi (	OSPECT CO	<b>53</b>
	Ì	20 FAILURE TYPE	PRIMARY		UKKROKA			LURE			OR	-
- 1	Į		- HOLESO		NO FAILURE				A STORES	منا 🗖 ر		_
	.	37. RESPONSIBLE ENGINEER	16 Con	all.	JEBE C	18-15-	79 38 SYEFE	CRAFT HENDR	12 Crass	122	61 °A	316
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### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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#### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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#### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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#### HUGHES

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### SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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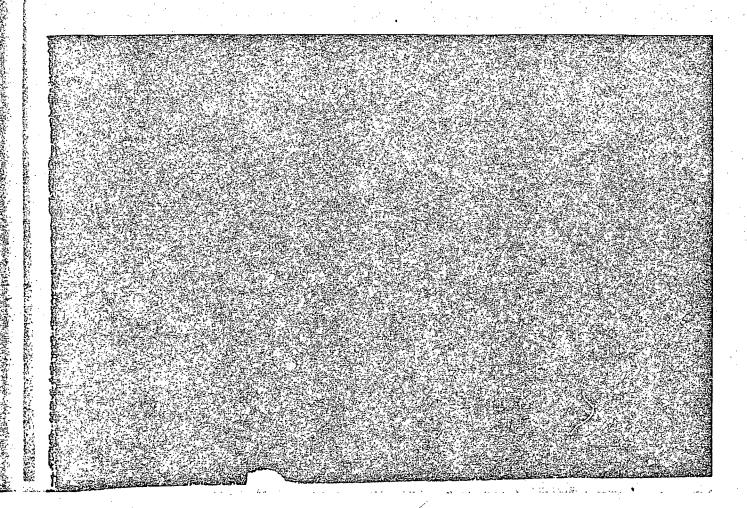
	BL SEEURGO, CALIFORNIA					·			
	1. PROGRAM NAME AND NUMBER VOII	2 GLA		1 WOOSL PLIGHT	1:32 p. #	L DATE OBSERVO	73 YR &		
		SUBSYSTEM			MODULE	A CARD			
1	EQUIPMENT IDENTIFICATION:	NAMS		PART NUMBER	S/N	MARA	PACTURER		
	7. SUBBYSTEM  Q. UNIT						<u>_</u>		
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1	CHANNELS 4,7,8,11, 19 TEST PROCEDURE /6368	IPARA	- 7	GIFLATOR )	S NOT	CATE	UT.		
-	18. VERIFICATION AND	143	1 1/4	C. JAVISON	16 - 1.61	216-16-81	SHEET USO		
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IGIN	OF VERIFIED GENERONMENTAL CALLURE GENEROLITIES CONTROLLED CONTROLL	TEST PROCEDUR	E ÆAS!	SY/FAB ERROR					
Ē	TYPE PRIMARY	NO FAILURE		CLASSIFICATION	C MAJOR	MINOR  SAFETY			
	1111111 - January - 1	ORG DATE	1/2/31	B) SP SCEERAFT SYSTE	La Villa	el 22-4	11/19/8		
	19 AFLIABILITY.	ORG DATE 51-11 11-	13-81/	AC AUSTOMER OR BUP	PLIER		DATE		
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#### SANTA BARBARA RESEARCH CENTER

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#### AVOID VERBAL ORDERS

TO	Lloyd O'Connell, Mgr. Reliability	DATE November 19,1981
FROM	Dee Evans, Reliability Engineer	SUBJECTFR #8014
	After carefully reviewing schematic	in conjunction with subject failure #8014,
<del></del>	I comfortably feel that no overstr	ess has occurred to any components regarding
	subject failure.	
		Dee Evans, Joe Cord Reliability Engineer



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	d. Hardware Level Spacecrap When Failure Was Observed System	T SUBSYSTE	AS AS SU	semoly Dassemoly	☐ MODULE ☐ MICAM	CARD PART		
	EQUIPMENT IDENTIFICATION:	BMAN		FART NUMB	en :	S/N	MANUFACTURER	
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	15. TEST PROCEDURE 1630	PAR	16. ORIG		DRO	DATE	17. CONTINU	
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	us to the fine and be	arentiko			31. SHEET USE	NON P		
2	32. DOCUMENT IMPLEMENTING CORRECTIVE ACTION	2 miles	<del>/</del>		<del> </del>			
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	OF VERIFIED   DEFECTIVE P	NIAL TEST EQUIPM	DURE 🖳 ASS	Y/FAB ERROR	WIRING ERROR ROUGH HANDL WEAR-OUT		. 1	
2	TE FAILURE OR PRIMARY	UNKNOWN		36. FAILURE	CRITICAL	25 min	OR	
l	TYPE INDUCED  37. RESPONSIBLE PRIGHEER	ORG 7	MK / /	CLASSIFCATED	TEM ENGINEER	SAI	PETY DATE OF	
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	1. PROGRAM NAME AND NUMBER	2 GLA		COSESVED S. DATE COSES	DA Q3 YR8/
	G. MAKOWARE LEVEL   SPACECRAFT WHEN FAILURE WAS OBSERVED   SYSTEM		SSEMBLY D MODUL		
	EQUIPMENT IDENTIFICATION:	MAME	PART HUMBER		MOUPACTURER
	7. SUBBYSTÉM				• •
	a. uku				
<u>e</u>	2 X ASSEMBLY D SUBASSEMBLY PR	e-AMP BAND 1	50797	401 5B	ec
ATO	10. C, MODULE C MICAM C CARD				
RIGINATOR	11. OTHER		•		
8	12. TEST WHEN FAILURE WAS OBSERVED OIN-PROCESS	O QUALIFICATION INT		H OFERATIONS	
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	19. TEST PROCEDURE	PARA & IS ON	CHATCH	ORG DATE	17. CONTRALATION
	18. VERIFICATION AND	PARA B IS ON	C. R. alpha	22 3 77-03	
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<u></u>	21. REWORK/RETEST ACTION TAKEN BRANCHE	tof allowed	like son 1790	50 277772	24 04 PARTY
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AND	al thenger now me	Landia po	mark su	Aford2,	
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Š	35. FAILURE   PRIMARY	UNKNOWN NO FAILURE	CLASSIFICATION	ICAL C MINOR	
	37. ALBERTHE STERNER	ODC OATE	38. SPACE PAFT LOSTEM ENGLIN		RI 02 10 100
	ZANTEUABIUM	ORG CATE	40. CLETONER OR SUPPLIENT	1 160	DATE DATE
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## Program Instruction 010

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as defin for all -59dB vs	channels. channe	3440. Ch icat	Atta annel ion of	sched two <-6	l is has OdB.	a copy averag	of FR 8	440 alk	and the between th	ran een	sien non-	t res	sponso abors	e p	10
as defin for all -59dB vs	channels. channe	3440. Ch icat	Atta annel ion of	sched two <-6	l is has OdB.	a copy averag	of FR 8	440 alk	and the between th	ran een	sien non-	t res	sponso abors	e p	10
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as defin for all -59dB vs Band 1 h enough t	channels. channe	Chicar icar	Atta annel ion of	thed two then a c	l is has OdB.	a copy averag	of FR 8	440 alk	and the between th	ran een	sien non-	t res	sponso abors	e p	
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HUGHES AIRCRAFT COMPANY. SPACE CHOITAGHUMMCS CHO SOME

FAILURE REPORT

	EL SEGUNDO, CALIFORNIA			
Γ	1. PROGRAM NAME AND NUMBER PL 1162		SHIFT MO 8 OF	25 YR 81
		ASSEMBLY C MOOU SUBASSEMBLY C MICAN		
	EQUIPMENT IDENTIFICATION: NAME	PART NUMBER	S/M ISAN	UPACTURER
ŀ	7. SUBSYSTEM			
	a unit			
	S MASSESSIELY SUBASSEMBLY ZAND 3 AST AMP	50904-3	201 SEA	<del></del>
5	10   MODULE   MECAM   CARD	130/04-3	201 000	
A	11. OTHER	<del>                                     </del>	<del>}</del>	
ORIGIMATO			<u> </u>	
8		ntegration () Lauric System ()	H OPERATIONS	
	13 ENVIRONMENT O AMERICAT O RAGILATION &	FOR MEN TYPE	AL VAC TA SAH	
	14 DESCRIPTION CHANNEL & FAILED B	MEET THE	Me-GOM BES	5700 (R90
}	SELECTION REQUIREMENTS A	UTHOUT WSIAI	E A CAMPOA	IEM T
	BUTSIDE THE SELECT RANGE.	LIMITS :2.61	K 70 5.90K:	VALUE: T.4
	TE TEST PROCEDURE 16597 PARTY S TO	ROLL ROLL A	22/3 8-25-8	17. CONTINUATION
39	13. VESTRICATION AND PARLURS ANALYSIS	112390	1 200 00 00 00	
EVALUATION		ST TEST/SA	es Section	7 410
A		3 <i>T_1</i> 557/S&	et Star	
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	RESISTER VALUE.	. I'S FAILED ITEM INATE PROPERTY OF THE COMMENT THAT COMMENT THE COMMENT THAT COMME	<u>e-gan lens</u>	red (1770
8	28. CI FOLLOWERS REWORK/RETEST NOT REQUIRED GECAUSE FRA DUT.	- OF - PANGI	2 VALUE	15
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ENGINEERING	The state of the s	1/2001 2	OAS DATI	A HE COMMENTATED
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5	ACTION PAREN ALONE			-
TEST				25. OA HETESY
AND				- Law Car resident
9				
NE SE	28. UST ALL PARTS REPLACED CKT SYM PART LOT MUMBER DATE CODE	MARUPACTURER	PROBABLE DEFECT	AMALYSIS NUMBE
NUFACTUREN	.1/4			
AC	NA			<del></del>
3		<del> </del>		
MA	ZI. REWORK BY	RETESTED BY NIA	ORG DATE	28. COSTINUATION
Н	30. CAUSE AND		NOT GRAP	
l	CORRECTIVE ACTION RANGE SECURIES			_
	ENOUGH TO PERMIT ASJUS		0. 70 S/S/ 31 FAO CLOSUR	<u> </u>
<b> </b>			VGE TATO CLOSUR	
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ING/F	3. DOCUMENT IMPLEMENTING B 0 3 del 7 A -	SEEGTIVITY SIL	202 840 // /	1 1 1
eening/r		AFG. PROCEDURE CHIRING		DEFECT CODE
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engineering/reliability	DA BASIC CAUSE   DESIGN   TEST EQUIPMENT   A PRIMARY   DEST SETUP   DEFECTIVE PARTS   TEST SETUP   DEST SETUP	AFG. PROCEDURE GRAING SSYIFAB ERROR ROUGH VORKMANSHIP WEAR- JOS FAILURE GRAING CLASS/RICATION MAJ	ERROR UNKNOWN HANDLING BUT  ICAL  IC	
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ENGINEERING/R	30. BASIC CAUSE   DESIGN   TEST EQUIPMENT   DESIGN   TEST PROCEDURE   DEFICITIVE PARTS   TEST SET-UP   TEST SET-UP	AFG. PROCEDURE GRAING SSYIFAB ERROR ROUGH VORKMANSHIP WEAR- JOS FAILURE GRAING CLASS/RICATION MAJ	ERROR UNKNOWN HANDLING JUT JICAL JE MINOR OR J SAFETY	

## MAIN ALR OFN# 2300

## SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

ORIGINAL PAGE I OF POOR QUALIT

_,	EL EEGUNDO, CALIFORNIA  1. PROGRAM NAME AND NUMBER	12 GLA	RE REP		000000		3
	YOU T.M.		FLIGH	T WE OR		A DATE OBSERVE	
	8. HARDWARE LEVEL   SPACECRAFT WAREN FAILURE WAS CHERNED   SYSTEM	SUBBYSTEN	ASSEMBLY SUBASSEMBLY	☐ WOODULE		C CARD	
-	WAS COSERVED   LI SYSTEM EDLIPHISHT ICENTIFICATION:	NAME		D MICAM	S/N		FACTURE
ı	7. SUBSYSTEM						
	8. UraT				212-1		
_	9. D. ASSEMBLY A SUBASSEMBLY	(1/2 BAND)	) 510			366	20
ē	10. I MODULE I MICAM I CARD			- A	-	ن حب	- C
RIGINATO	II. OTHER						
E	12. TEST WHEN DEVELOPMENT	CUALIFICATION	INTEGRATION	D LAUNCH C	PERATIONS	<del></del>	
0	OBSERVED IN-PROCESS	ACCEPTANCE	☐ SYSTEM		<del></del>		
	WAS OBSERVED   EMC/RA	☐ RADIATION ☐ VIBRATION	AXIS FOR	· THERMAL	VAC	HRS AT	
ļ	14. DESCRIPTION CHANNELS	1 \$ Z E	XHIBIT E	YCESSIVE	Cold :	ISE A	=TE
Ì	REPEATED CHANG		ETS.		1.33		
ļ	18. TEST PROCEDURE 1650	6 PARA 7	18. ORIGINATON	1110211	2713	DATE -01-81	17 G
<u>_</u>	18. VERIFICATION AND FALLURE ANALYSIS FALLURE ANALYSIS	0.4 - 166	A 3014	WISON !	2	20/1:	7-2
EVALUATION	PARCOND ANALYSIS STEEDS	usion See T	2983	- 60-01 /		<u> </u>	
S	for favore harry	gasa, Jee 1	<u> </u>	-00-01	(V-0	3 4 / 277/	
3	<u> </u>	<del></del>	HA FALLED ITE	DA NAME	800	1000	
	20. SE FOLLOWING REWICKLANTEST REQUIRED	00	AND PART	NOVE STATE OF THE PARTY OF THE	300		W 65
EDING	TREMORE/RETEST NOT REQUIRED BECAUS	<u> </u>	HALL MARKET	Est She   9	3 2	V-11	
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3		n 21. AUTHORIS	III Lang		7122	92/18/	72 CX
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1681	Las Supplement	£/					1
200							a 0
٥l							
CLORES	21 UST ALL PARTS REPLACED PART NUMBER CXT SYM	PART LOT NUMBER DATE	CODE MANUFACT	TURER	PRODABLE	DEFECT	AHAL
E	50860	5N	2/5				<u> </u>
3					,		
MARUFA	1 Day		2	20			
23	27. REWORK B	2273 7-11-82	CAULD LO	200	22-13	2/22/22	29. CC
٦	CORRECTIVE ACTION ALLUR		IS CANCE	LUDER	THA	T / THIS	
.	A PANDON EAILU		PRERETIKE	EPT 10	NIS DI	EMED 13 FOR CLOSURE	APT
•••	REFERENCE IN		0/ /82-8			33. FTB CLOSURE	
Èţ	APPRICHED ) (REFERE		12 /-60 -01	183-04	2	1	
	(004 A-01/F0)	<u> </u>		/		1	1
١			······································	,		1/~	فلممر
3			<del></del>	III. CONTIN	USED	11/15	16
91	32. DOCUMENT IMPLEMENTING	-60-01/82-03	29 (-0-1				11 5
<b>ĕ</b>	34. BASIC CAUSE   DESIGN		MFG. PROCEDURE	WIRING ER	ROR:	UNKNOWN	DEFEC
EERIN	OF VERIFIED   ENVIRONMENTAL	TEST/EQUIPMENT TEST PROCEDURE TEST SET UP	ASSY/FAB ERROR		MOUNG //	<u></u>	L
GINEERIN	FAILURE DEFECTIVE PARTS					MINOR	
ACCURECE	FAILURE W DEFECTIVE PARTS  35. FAILURE PRIMARY	UNKNOWN	30 FAILURE	OTTO THE CRITICAL	•••		
- [	FAILURE DEFECTIVE PARTS	UNKNOWN NO FAILURE	CLASSIFIC	ATION I D MAJOR	<b>3</b>	SAFETY	999
-	FAILURE DEFECTIVE PARTS  35. FAILURE PRITIARY THIS HIGUCEDS	☐ NO FAILURE	EZ 30. SPACICAL	ATION I MAJOR	<b>3</b>	SAFETY	927/ 27/ 27/E

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58229

## Hughes Aircraft Company

## INTERDEPARTMENTAL CORRESPONDENCE







To: L. Wolthausen

ce 9. Adeas L. O'Connall

EATE: 14 July 1982 REF 12-60-01/82-042

magen: Rationale for Failure Classification

Aym,

PROM: J. Mazenko

ELCO: 604 EXT: 21218

MAIL 3TA: 8253 ORG. CODE: 12-60-(

Silicon Precapilifier P/N 1950594/50860 serial number 215 was failure analyzed on 30 June 1982 (rof. ISC 12-60-01/82-037). The hybrid was found to be noisy on channel B. It was determined that transister Q3 (200405) was defective. The failure was classified as random since no previous failures of this type had been seen. Below is a list of "Flight" Silicon Pressplifiers previously returned for retest and the disposition of some.

## SILICON PREAMPLIFIER PART NUMBER 1950594/50260

PART NUMBER	APPROXIMATE RETEST DATE	DISPOSITION
116	10 KOYEMBER 1980	RETESTED. MEETS SPECIFICATION.
154	10 hoveiser 1980	OPER PIR 10-13. MISSING HIRE DOND.
169	3 AUGUST 1981	RETESTED. HEETS SPECIFICATIO
193	11 MARCH 1582	open pin 10-13. Hire bond pin 10-1 Fused open.
97	30 JUNE 1982	RETESTED. MEETS SPECIFICATION.
202	30 JUNE 1982	REMESTED. MEETS SPECIFICATION.
<b>នា</b>	30 JUNE 1982	RETESTED. MEETS SPECIFICATION.
208	30 JUHE 1982	REDESTED. HEETS SPECIFICATION.
165	30 JUNE 1982	REMESTED. HEETS SPECIFICATION.
169	30 JUNE 1982	CHARNEL B OPEN.

(Note that serial #'s 165 and 169 were submitted twice for retest)

As seen from the data above, none of the Silicon Preamplifiers exhibited failures related to the 2N4405 transistor; thus, as previously stated it is assumed that the failure mode for Silicon Preamplifier serial # 215 may be classified as rando

## ORIGINAL PAGE IS OF POOR QUALITY

58229

## INTERDEPARTMENTAL CORRESPONDENCE







SBAC

. O'Connall

DATE: 14 July 1982 REP: 12-60-01/82-042

Rationale for Failure Classification

J. Mazenko

608 OLDO: 21218

MAIL STA: B253 one core: 12-6(

Silicon Precapiffier P/H 1950594/50860 serial number 215 was failure analyzed on 30 June 1962 (rof. ICC 12-60-01/82-037). The hybrid was found to be notay on channel B. It was determined that transistor Q3 (280405) was defective. The failure was classified as random since no previous failures of this type had been seen. Below is a list of "Flight" Silicon Preamplifiers previously return for retest and the disposition of some.

## SILICON PREAMPLIFIER PART NUMBER 1950594/50860

PART NUESER	APPROXIMATE RETEST DATE	DISPOSITION
116	10 KOVEDBER 1960	RETESTED. MEETS SPECIFICATION.
154	10 HOVEFBER 1980	OPEN PIN 10-13. MISSING WIRE BO
169	3 AUGUST 1981	RETESTED. HEETS SPECIFICATION.
193	11 HARCH 1982	open pin 10-13. Hire bond pin 10 fused open.
97	30 JUNE 1982	RETESTED. MEETS SPECIFICATION.
202	30 JUNE 1982	RETESTED. REETS SPECIFICATION.
81	30 JUNE 1982	RETESTED. MEETS SPECIFICATION.
206	30 JUNE 1982	RETESTED. HEETS SPECIFICATION.
166	. 30 JUNE 1982	RETESTED. HEETS SPECIFICATION.
169	30 JUNE 1982	CHANNEL B OPEN.

(Note that serial #'s 166 and 169 were submitted twice for retest)

As seen from the data above, none of the Silicon Preamplifiers exhibited failur related to the 2K4405 transistor; thus, as previously stated it is assumed that the failure mode for Silicon Preamplifier serial # 215 may be classified as rat

HUGHES AIRCRAPT COMPANY

## ORIGINAL PAGE IS OF POOR QUALITY

## 58229







INTERDEPARTMENTAL CORRESPONDENCE

ro: L. Wolthausen

co: '0. Adams L. O'Connell CATEL 30 June

30 dune 1982 12-60-01/82-037

BUBLECT:

Failure Analysis of Silicon Presmolifier Hybrid

PRODUCT O

J. Kazenko

604

21218

exer 17x3 Mail Sta.: Org. Code: 8253 12-60-01

SILICON PREAMPLIFIER

PART NUMBER:

1950594/50860

SERIAL NUMBER: DATE CODE:

215 2880

The above hybrid was retested per SBRC Spec. #16099 and found to be out. of spec. on Channel B for spectral noise at both 10 KHZ and 20 KHZ.

The hybrid passed fine leak, gross leek and pind test. Upon delidding the cause of failure was determined to be Q3 a 2N6405. Q3 was replaced with a dice from lot 8-7066 (the same lot as used in the original hybrid build). The hybrid was then retested and found to be within spec. The test results are shown below.

Spec | 1mit <1.7 mV/ VHZ (Paragraph 1.6 of Spec \$16099)

FREQUENCY	DATA 7/24/80	DATA 6/10/82	SB/62/9 GASATAS ED
to KHZ	1.3 na	. 2.3 87	1.5 AV
20 KHZ	1.4 ny	1.8 nv	1.4 89

Since no other failures of this type have been seen this may be assumed to be a rendom failure.

A MAZARKY

Hander Technical Staff

Technical Support Laboratory

Engineering Services & Support Division

olm:HL

•				•			ORIO OF	GINA POO		AĞE UALI	IS ITY	. H.		587	229 —	•			
	. with 100 3	SUPPLEMENT NO. 1 10 ALIR DATED 10-19-81	SUPPLEMENT RELEASE DATE 12-17-BI	HOLL TO PRODUCTION – UPON RECEIPT, ENIER SUPPLEMENT NO. AND RECEIPT DATE ON FRONT SHIET OF AHR—INITIALINE ENIRY.		REMARKS									अर्थंड अंग्रेस	SEE COMMENT SYEET & 2	NEVE 312546		•
		SUPPLEMENT NO. AIR DATED 10-	SUPPLEMEN DATE 12-	HOLE TO PRODUCTION UPON RECEIPT, ENTER NO. AND RECEIPT DATESTEE OF ANTEL PRINTED	INVE HE	BY						delle	180	12/2/21	VEZIPY	18-61			
	*		2 3 2 2 2 2 2 3 2 3 2 3 2 3 3 3 3 3 3 3	W A	15 FEB 310	PERFORMED BY							Jan		U				
	IN!	J. Wells		ANIMOND OF CANAL	STATIO SLUSINVE IMITALE PER 3789	DEG.					C					J. J.	2		C .
	HISIORY RECORD SUPPLMINI	1 (082	APPRENCIA THEM APPRING A	8 8 11 11 11 11 11 11 11 11 11 11 11 11		Sh				Angels have been transmitted.		B/P & ABC/TR.		B/P & ABC/TR. f		(Item 6) from preamp assy. (Bag	Submit to inspection.	•	buhing (Itama 15 016) to
	ASSEMBLY III	51015	NEW ASSY			INSTRUCTIONS						(Item 6) per		Operation #2301 per B		5	removed part.)		and the classical factors
		212	PUKPOSE OF SUPPLEMENT - INCORPORATES	EXPLAIN:	SAME AS ORIGINAL AUR				PURPOSE:			Kit (1 ea.) Hybrid		Kit Inspect Opera		1) Remove Hybrid	and identify		ol' Install adum
	7 2 3	51015-1	SE OF SU		•	S/C NO.						21-21		51-14	. •	22-73			
	S.	FART NUMBER 51015-1	PURPO PRAWE	OHER U.	NOIES:	OPER NO.						2301		2302		2303			
	. ,									_	•		٠.				•		

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J	82	مع	7

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शास्ता था अ	COMPINIATION OF: AIR DATED 10-19-R1	ahr supplement no. 1	REMARKS							•	•				CENTRACT SICELA		SEE RETERU			
	CONTIN	AHR	BY DATE		11-1			1-2-8	1-0-62			7/13/2			11//1/	4/4/50				
;   			PERFORMED INSP		Termina I a			ر نووه:	<u> </u>										終し	
		<b>&gt;</b>	PE OPER		180	2_					os senis									
ASSIMILY HISTORY RECORD COMININATION SHEET	SERIAL OR LOT NUMBER. ASSEMBLY NAME	212 SILICON PRE-MIP ASSY	INSTRUCTIONS	Continued	3) Install Hybrid (Item 6) at Ul to preamp assy per B/P	and Note 3. NOTE: Observe correct pin location,	(Ref. zone 5D)		Inspect operation #2303 per B/P. Put removed Hybrid on	N.C.M.R. Record M.C.M.R. # 342549.		HANDATORY CUSTONER INSPECTION STATIC SENSITIVE ITEM	STUDIE PER STUDIE	1) Notify Q.A. & A.F. before testing.	COUBERD ALL TEST DOUGHE ITHES. PRING TO FEESTING		* NOTE: Attach test data to AMR.			" NOTE: Spot bonding of liybrid will be performed on miln
20 20 20 20 20 20 20 20 20 20 20 20 20 2	PARI NUMBER	51015-1	S/C NO.	22-73					51-14			1351		22-13			صنوب م		51-14	
s.	PARI 1	2	OPER NO.	2303					2304			23:05		2336				10,5	2307	

**************************************	.38229
age 19 Uality	Limit: 2.4 pa
Noise	REB
pA	1:15 ×109
2.2	1.10
2.3	.85
2.3	:90
2.1	1.05
2.2	.97
1.9	1.00

ORIGINAL PAGE 18

OF POOR QUALITY

Pre-Amp

Output

2.40

1.97

2:06

217

2.17

1.89

2.00

2.40 mV

2.1

worker of cost for Out Fit (in 43) - Poin ing instit (in 40) grows Cate (in d3) For The Armidian Scrib

Converted From c3 to Gain

<u>Gain</u>≠

350

wideband noise

Meter

1.

2.

3.

5.

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\_84\_v

. 84

.69

,72

76

.76

166

.70

307 CR. (26.91) - 27.79

Date: <u>F2B. 27</u>, 1982 Dosign Engineer 2-22-82

> CODE IDENT NO. NUMBER 11323 A 16306 -SCALE REY SHEET 12

COL MIZZ-1-A (S-691 DISTERICH-POST CLEASPRINT TOCON

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MODEL FESTIVITY	2000	REVISIONS	DATE	
	SVM	INITIALLY RELEASED 9-5-78	JAIE	APPROVED
IRST USE	D	Completely revised and retyped to incorporate new system specs & update test procedures.  As required by ECR TM1103/01.	12-6-79.	Q-N TI
R. No. & SUBQ	E	Incorporated EO 1610	80-8-29	13-2-18-1/.
51065 SER. No 102 & Subq.	£.	Paragraph 4.6 added: Transient response gold wires are not damaged. as req by ECR TM 1913/01.	80-09-12	Wig. Ki
065 1603 1499.	G	Incorporated E. O. 2149A	12-2-30	
65 SN & 5:50	H	INCORPORATED ED 2960A.	81-4-20	MY NO
65 S/N & SUBC	J	Changed by Revision Notice per ECR No. TM 2339/Ol	81-5-22	
ET'S Vo CH Voise. R	23 TR E) BN RN ECO	NOT MAINTAINED AFTER  DIFFERENTI  DO NOT USE THIS DELLAR  WHEST TOUR SETTING	0 1A	· /- &/
		CONTRACT NO.  NAS 5-24200  CHECKLE  CHECKLE  A Subsidiery of Mughes A GOLETA, CALI  CHECKLE  CHECKLE  CHECKLE  APPROVED  APPROVED  APPROVED  APPROVED  APPROVED  CONTRACT NO.  SANTA BARBARA RES  A Subsidiery of Mughes A GOLETA, CALI  TEST PROCEDURE  FOCAL PLANE PREAMP  APPROVED	FORNIA	ENTER
		A 11323	16306	,

			•	·	58229
4.7	Wideband nois	<b>e</b>	Or.	GINAL PAGE 12 POOR QUALITY	limit: 2.4 pa
<u>Ch</u>	Meter	Gain≍	Pre-Amp Output		Res
•	<u></u>		mV		1.15 X103
2.	大学	•		***	1.10
3.	.66	343	1.92	2.3pA	CF 84,85
4:	*68	343	1.98	Z.Z.A	.90 1.05 CPL
5.	.77	343	2.24	2.1	
<b>4</b> .	No	RESPONS	E		.97
•	NO	BESPOR	SE		1.00
	,73	343	2.13	2.2pA	94.96
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	er var er er var e	Tu: 13 to 7:		•	
	( –		\		
ioe ·	7.20	<u>6</u> - <u>C-15</u>	.88) + 2	7.55	343
•				<b>-</b>	•
Jesta	n Engineer		•	Date	•
-	Engineer	C.R. L		Date	: 11-25-81
?.∴.	Enzineer 12	12 CH 1, 2 V. Noise	PA W. B.N WITH W H-NOWZITTEN DATA	ORE POLLED OCH 6, 7 ORESPONSE DATE	12/02/81
※ (	CH. 4 DaTA	WITH DET	ECTOR WIRE	PULLED - NE	ED NEW DETECTOR
	CH. 1-2 UEA	•	- NEED NI	ew rets	
	CH. 6-/ 1/	64 10 E W		· ,	· · · . · · · · · · · · · · · · · · · ·
			Size   CECE :0	23 NUMBER	:05
			SCALE	REV .	SHEE7 12

...

.4.7	Wideband noise		ORIGINAL OF POOR	Page is Quality	58229
) Ch	Meter	<u>Gain</u> r	Pre-Amp Output	<u> </u>	Res.
1.	1.35V	•	3.94 mV	3.4 1	1.15 X109,
2.	25000	NONSEY	(VERY)	-	1.10
3.			and and		
4.	No RE	SPONSE			,90
5.			•		1.05
6.	PEGGE	<b></b>			.97
7.	.70	<u>343</u>	2.04	2.0	1.00
3.	<del>that you go their</del>	<del></del>	-	-	.96
e Service e Service					
w Cat	•		3) - Post imp : The 10-W/div :		
,	-		· •		
log	\[	- ( <u>-15</u> .	<u>88)</u> - <u>27.</u>	55	<u>343</u>
•					
	n Engineer	~.R-		Date:	12-01-81
	Engineer PB				12/02/91
	1,2 NEW .		•		13/3/21
	6 NEW 1				
	I		ST AFTER	REWORK	ON
)		C#. 1, 2	SIZE CODE ICEMI		· · · · · · · · · · · · · · · · · · ·
			A 1132		
2 6432-1-A 10-0	/ PI GIETERIÇN-POŞT CLEARPRINT	1000s ·	SCALE I	ξV ,	4667 <u>12</u> 6.

MAIN AHR-CP#2600

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# SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

_	EL SE TUMBO, CA					_				
	1. PROGRAM NAME A	NO NUMBER	2	GLA	FLIGHT	3:3	BSERVED A.M.	S. DATE OSSE	RVED DA 26	YR &
	0. HARÓWARE LEVEL WHEN FAILURE WAS OBSERVED	SPACECRAFT SYSTEM	Sugars		SSEMBLY UBASSEMBLY	MODULE		CARD PART		
	EQUIPMENT IDENTIFICA	ATION:	NAM	4	PART HUMBS	gi j	S/M	м	AMUFACTURS	Я
1	7. SUBSYSTEM					00	,			
	& UNIT		DA.	Q	50904	-3	201			
œ	8. ASSEMBLY	A SUBASSEMBLY	3/40 D 10% J		50797		201	SER	C	
170	10 I MODULE II N	HCAM CARD								-
RIGINATOR	11. OTHER									
OBIC	12. TEST WHEN FAILURE WAS OBSERVED	D DEVELOPMENT	OUAURC		TEGRATION (	LÁUNCH (	OPERATIONS	· · · · · · · · · · · · · · · · · · ·		,
	11 ENVIRONMENT WHEN FAILURE WAS OBSERVED	AMBIENT D EMC/RPI	RADIATIO	<b>,</b>		THERMAL	VAC	HRS AT OTHER		-
	14. DESCRIPTION OF FAILURE	HANNEL	4 NO!	<u>s</u> 15	2.6 pA	CH	ANNE	· 9	MOLSA	<u></u>
	15 20	PA	Secrete	ATTON	<u> 16597 P.E</u>	OUIR	EMEA	17.15	25	aA
	OR GEN	S. Seels	Lineste	Report for	Referenced	L.B.	f day	Joseph St.	472	Z
1_	15. TEST PROCEDURE	1659		47	CHAISO	A I	221 <b>3</b>	8-28-	21 1	et usi
22	18. VERIFICATION AND						•			
EVALUATION					·	•				
18							-			
NA N					19. FAILED ITEM HAME			**************************************	·	
le	20. C FOLLOWING RE			- A.	11		4	•	(.)	_
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ENGINEERIN				. AUTHORIZATION			ond.	1 0 A 7 E	130 60	1770014
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,	23. REWORK/RETEST ACTION TAKEN				•	1,4		14	24 OA	REPARCE
1683										
AND		-							25. CA	RETES
Ž	29 LIST ALL PARTS RE		PART LOT NUMB	ER DATE CODE	MARUFACTURER		PROBABLE	CEFECT	ANGLY	SIS NU
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la s	50803				<u> </u>					
13	7000		<del> </del>		<u> </u>	<del> </del>				
MANUFACTURING	27. REWORK BY		one DAT	E 28. F	ETESTED BY	<del></del>	ÖRĞ	DAYE	20. CO#	TINUA EET US
r	30. CAUSE AND CORRECTIVE ACTIO	" Thema	ist on	Rammel	of how be	on Sec	in so	ne I	te and	
1	mora hair	I and in	a link	to a contraction	o sera La	2118	757	Delecto	J. Col	he
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9	10 The 10 The	me seco	georgie	all st	30us	SHEET	USED	1////	% \~	(1)
200	32. DOCUMENTIMPLEA CORRECTIVE ACTIO		£ (Copy	ATTAC	HED)		/	1//	\	<u>'</u>
engineering/reliability	3A. BASIC CAUSE OF VERIFIED FAILURE	OESIEN- 16 ENVIRONMENTAL DEFECTIVE PARTS	TEST ECU TEST PRO TEST SET	CEDURE 🔲 AS	G. PROCEDURE SY/FAB ERROR CORKMANSHIP	WIRING E	ANDLING !/	/ ZUNKNOW!	N DEFECT	CODE
2	JS. FAILURE	PRIMARY INDIVIDED	SUNKHOW! O NO FAILUE	IÉ .	38. FAILURE CLASSIFICATION	CRITIC	AL	©¥MINOF	Υ	
	The second state of the second	NEER	27/22	DATE /9/8/	B. SWAFECEAFT TES	'EM ENGINEE		22.4	H 12/	181
	N RELINGIUTY		29/11	12-18-81	State on st	PLIE	K		SAJE	1
	l de la	CIND	المارات: المارات:	112-10-01	11.15	/			1 '	

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HUGHES AIRCRAFT COMPANY

SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

593/7 CONT. SHE

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F 11323 Ti	16516. 10. 20. 20. 20. 20. 20. 20. 20. 20. 20. 2	X Tone	ALLO:	Pesa-		Des Willer
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Control of the Contro		1	1	!		
Permission to use Band 3	Bend Level Assys	SN 201	~	· 1.	(2) 10 2 7 40 NAS 5-26	-
Radiometer		11	HITTET OF 14	X Human	SIFICATION ONLESS	Certi
Band Lovel Assy	50797	203	1	V28		X =
Greater than \$100,000-if	nor accuracy	21 101467 10		not app	· - · · ·	

Permission to use Hand 3 Band Level Accy SN 201 with Ch 4 noise of 2.6 pA and Ch 9 noise of 2.9 pA vs a spec of <2.4 pA and Channels 1, 7, 3, 4, 6, 8, 10, 12, 14, 15 & 16 not meeting transient response settling rime requirement of <1.5% by 30 vn. Copy of FR 8317 attached.

24. LEE FOR SEVIATION/ MIVED

11. 265COIPTION-CP DEVIATION TAIVED

Noise performance of the 4 % 4 will still allow system signal to noise performance to be mat and all channels have transient responses that settle to 17 by <50ms. The resurk required to correct the discrepancies described above is nor considered cum or schedule effective.

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23. Prince the Englishing of String Goods			· · · · · · · · · · · · · · · · · · ·		-	.,	<u></u>
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I seed an errowerded	* APPROVA		4P==0VC3	· ·	U134808	?~ CZ	
er were ment at the reference		1	-Jones	Buse		17.17.0	<u> </u>
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AHR Oper 2600

PM 50797 BX

# SPACE AND COMMUNICATIONS GROUP FAILLIRE REPORT

**S** 8318

	EL SEGUNDO, CALIFORNIA	ner un i	<b>G</b>	
	1. PROGRAM NAME AND NUMBER PM VOII PLII62	FLIGHT DAY	SHIP MO 9 DA	2/7 YR 8/
1		SSEMBLY UNCOUN	LE CARD	7 3 30
1	CLUPACIAT IDENTIFICATION: NAME	PART NUMBER		EUFACTURER
L	. SUBSYSTEM	TANT NOBELEX	37.4	STACI GREA
H	L UNIT			
_  -	DASSEMBLY SUDASSEMBLY FAM BAND 1 POR	MP 50797	1404 572	2 /
OBIGINATOR		MP 50797	401 SBK	<u> </u>
& I	1. OTHER	<del></del>		<del></del>
	2 TEST WHEN COEVELOPMENT COULLIFICATION CIN	TOURA D CONTARDST	H OPERATIONS	<del></del>
	L ENVIRONMENT C		ك وفي المحمود والمراجع المراجع	· · · · · · · · · · · · · · · · · · ·
	WAS DESCRIPTION AND AND AND AND AND AND AND AND AND AN	N	ि जास्त	
<u> </u>	OF FAILURE CMS , 5, 9, 13 EXMIBIT		BG TRANSI	eur [
-	FREQUENCY RESPONSE AND	HIGH NO	ise	
-	E TEST PROCEDURE FAHA IIQ OA	guration -	dag CATE	Tit. CONTINUATE
11	16371 9.6	- James	2213 09-17-	JU. CONTINUATION
<b>3</b>  -	PARLURE ANALYSIS REASONAL TO SECOND	Marine !!	musi Chel	
4	To be at fails.			
EVALUATION		IG PACED ITEM HAZE	Post En	103
	2. C FOLLOWING REWORK/RETEST REQUIRED	AND PART HUMSER	HEIRIA SOL	
<u> </u>	SPROMORE/RETEST NOT REQUIRED GREAUSE PROPERTY A	e susses		
2		i A	7	
ENGINEERING	21. AUTHORIZATION	mil dill	2722 11/8/8/	Z. CONTRACTO C SHEET USED
Z	ACTION TAILEST OF FEET RESERVED AND		Stead acer	IL OA REVASRE
1834	action of a complete of the same		THE COLUMN	-
	CAR LIFE OF FR 61 18440 (COD	4 ATTICLES	7)	ZL CARETEST
ON PRO		S Africa Coffee Contract		7
	LUST ALL PARTS REPLACED CKT SYM PART LOT NUMBER DATE CODS	MANUFACTURER	PROBAGLE DEFECT	ANALYSIS MINIS
	50803 1033-29	-		
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-		ETESTED BY	ORG DATE	TR. CONTINUATION SKEET USED
3	CORRECTIVE ACTION Course of failure insu	Amone ile		As wently
4	rehadled to undage life time of	olowed by	33. FAB CLOSUR	Tiberral.
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		31:	ITINUATION ET USED	A LIVY
	L DOCUMENT IMPLEMENTING	(CO)	1/10	1~111
2 3	CORRECTIVE ACTION W/23 COPY ATTACH	EG. PROCEDURE WYRING SY/FAB ERROR PROGUGM		DEFECT CODE
	FAILURE   DEFECTIVE PARTS   TEST SET-UP   W	DRKMANSHIP WYEAR-		<u> </u>
	TYPE PRIMARY SELINKNOWN D. NO FAILURE	29. FAILURE CLASSIFICATION SAMA	OR SAFETY	
37	18/8/ 1/122 11/18/8/	EL SPACE CHART CHOIN	1687 ORG 224	1 12/18/8
X		O. TOT PHEN THE SUPPLIES	,	DASE

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S. SASE LIME MERCIES  WELLTYPE   1. SES. STATION FOR SEVIATION, GAIVER   3. SASE LIME MERCIES   6. OTHER MEDICATION    F   11323   TM   H-123   K FUNC.   ALLO:   PROBE-    T SPECIFICATIONS AFFECTED FEST PLAN   0. ORADINGS AFFECTE    SYSTEM   SYSTEM   11323   50797   E    TEST PLAN   11323   50797   E	MAJOS (CONTROL STREET
SBRC, 75 Coromat Dr., Goleta, Ca. 93117  4. CESTONATION FOR CEVIATION FOR DEVIATION FRANCE  F 11323 TM W-123 France CATED UST THE STREET OF STREET	40103 6P 5Y57E45 100 17035 YES X
SBRC, 75 COTOMAT Dr., Goleta, Ca. 93117  1. CES:JUATION SCR CEVIATION CAIVER  2. CES:JUATION SCR CEVIATION CAIVER  3. BASE LIME MFECTED  6. OTHER MADELITY OF THE STREET COORDINATE OF THE STREET CO	40103 6P 5Y57E45 100 17035 YES X
F 11323 TM W-123 FUNC. ALLO DESCRIPTION OF STREET S	en systems len itens yes X
F 11323 TM W-123 TUNC. ALLO. PRIDE-  F 11323 TM W-123 TUNC. ALLO. PRIDE-  1325 FICATIONS AFFECTED FEST PLAN 0. ORAWINGS AFFECTE  456. CODE SPEC./DOC. NO. SCR. CODE MARGER REV.  11323 50797 E  11323 50797 E  11323 FILL OF SEVILATION OF SERVICES  PET PLAN  PET PLAN  PET PLAN  PET SERVICES  PET SER	1001 17835 Yes ह
F 11323 TM W-123 TUNC. CATED PERSONAL CATED COST AFFECTE ST PLAN S. ORANINGS AFFECTE ST PLAN S	1001 17835 Yes ह
PETRICATIONS AFFECTED. FEST PLAN  O. ORAWINGS AFFECTE  OF SER. COOR MARKER REV.  11323 50797 E  TEST PLAN  PETRISSION to use Band 1 Band Level Assy SN 401  NAS	2
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Permission to use Band 1 Band Level Assy SN 401	(1C)4
ermission to use Band 1 Band Level Assy SN 401	
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Permission to use Band 1 Band Level Assy SN 401 NAS	
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Need of "ANT OR LOWEST ASSESSED ASSESSED 14. ANT NO. 00 THE DESIGN 17. LOT NO. 10. QTY 19. AECURBING DEVI-	
Sand 1 Band Level Assy 50797-E 401 1 Tres	
EFFECT ON COST/PRICE 21. EFFECT ON OLLIVERY SOMEOURE	
Greater than \$100,00-if not approved.   Six weeks	
Sone	
CESCRIPTION OF DEVIATION MAINER	
-59dB vs a specification of <-60dB.	
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## HUGHES

AHR 5078 - 1200

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SPACE AND COMMUNICATIONS GROUP

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FAILURE REPORT

8

						*	<u> </u>	
	I. PROGRAM NAME AN	VD//	2. GL	4	PLIGHT	4:00 p.m.	MO 9 DA	28 YR 81
	G. HARDWARE LEVEL I	<u> </u>	<u>.</u>	est.			A	20 TR 0 7
	WHEN FAILURE WAS OSSERVED	SYSTEM	SUBSYSTEM			MODULE Directam	CARD PART	
	COUIPMENT IDENTIFICAT	ion:	PAME		PART KUNGS			FACTURER
	7. SUBSYSTEM							
li	B. UNIT		· · · · · · · · · · · · · · · · · · ·		<del></del>			
П								<u>, , , , , , , , , , , , , , , , , , , </u>
æ	9. ASSEMBLY	SUBASSEMBLY	BAND PA	UR	5079	7 201	SE	RC
2	10. MODULE WHO	AM CARD						
DRIGINATOR	1). OTHER				}		}	<del></del>
2					<u> </u>		<u></u>	
8	TANLUNE ITAS	DEVELOPMENT	OUALIFICATIO		TEGRATION C	LAUNCH OPERATIONS		
	13 ENVIRONMENT					·		
П	WHEN FAILURE	☐ AMBIENT ☐ EMC/RPI	☐ RADIATION ☐ VIERATION	AXIS.		THIS PAN VAC	TA BRH	<del></del>
П	14. DESCRIPTION OF FAILURE		14,15716	Brick -		A	700	and the second
Н	OF FAILURE	PAMELS.	13 EXCA	ERS I	<u>Paalsipait</u>	RESPONS	<u> </u>	23107
	1 1.50 m	CHA	NAELS	1, 5, 9	13 8 15	HAVE	HON-MEA	REST 1911
	NEIGHEDRS	-58 dB	FOR CRE	STAL	K. SPEC	. REQUIRE	WENT: -	60 a B
	18. TEST PROCEDURE		1 PARA 4.6	. 149 09	MALOG	OAG	CATE	17 CONTINUATION
Н	IL VERIFICATION AND	16597	149.60	4.8	CLAVISE	M 2 2218	9-30-8	S SPEET USED
롲	FAILURE ANALYSIS							
EVALUATION			•			•		
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E	Z HENGHATHETEST	NOT RECOMED F. ECA	ii -					47
빓	T. Carlotte	none g	WT MAIL	بعومة زحمرنو	1 / 1/2/	166-11	Ciufer.	<u> </u>
3	Exmidians	to dela	e dien or	EXHIL	Buch sl		<u>.</u>	
3			21. AL	THORIZATION	in de la	060 27	CATE/GIE	22, CONTINUATION
H	21 REWORK/RETEST	<del></del>		ace files	ر المحادث		177	24. GA REWORK
TEST	ACTION TAKEN							4
뿔								<u> </u>
AMD			•	•				25. QA RETEST
								1
MANUFACTURING	28. UST ALL PARTS REP	LACED	T	Т	T	<del></del>	<del></del>	<del> </del>
Œ	PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MARSUFACTURER	PROBABLI	CEFECT	ANALYSIS HUMPER
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13								
3				<del> </del>		† — — — — — — — — — — — — — — — — — — —		<del> </del>
8	27. REWORK BY		ORG DATE	120.8	ETESTED BY	! CAG	DATE	20 CONTINUATION
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9	Les Marie	ment to	ر. کار میاسیرودد	11. 3.2		31_ CONTINUATION	1/1/1/10	101 191
Ž	32. DOCUMENT IMPLEME CORRECTIVE ACTION	NTING 1	2/1/24 40	2/10	2)	· .	7/10 (	
ENGINEERING/RELIABILITY			) ((2)17 A <sup>2</sup> )	ACHED	FG. PROCEDURE L	1 wasmes species /	USEX NOWIN	TORFECT CODE
2		DESIGN ENVIRONMENTAL DEFECTIVE PARTS	TEST EQUIPME	URE .AS	SY/FAB ERROR	ROUGH HANDLING	CONTRACTOR OF THE CONTRACTOR O	17
2			TEST SET-UP	, <del>5</del> w	DREMANSHIP E		Ckinne	J
W	35. FAILURE / /	PRIMARY	UNKHOWN  NO FAILUHE		CLASSIFIC TION	CRITICAL NAJOR	SAFETY	
1	37. FESPONSIBLE ENGINE	ER / / //	ORG, O/	ATE 10: 101		MA ENGINEER	22 41	DATE IR RI
	Be Deliverity	14111	1000 4 10	1/1/5/	EL CLUSTO LER OR SUP	20011	<u>ec 41</u>	12/10/01
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HUGHES

## SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKGUT FAILURE REPORT CONTINUATION SHEET

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SERIAL NO.

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SPACE AND COMMUNICATIONS GROUP POOR QUALITY

FAILURE REPORT \$ 8323

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	1. FOGRAM NAME AND NUMBER T.M., VOII	2 GLA	1 FULGH		OSERVED	B. DATE GESERVE	SAY OL
	8. HARDWARE LEVEL SPACECRAFT WHEN FAILURE SYSTEM	Mateyasuz	ASSEMBLY ASSEMBLY	☐ MODULI	1	CARD PART	
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5	12. TEST WHEN DEVELOPMENT OBSERVED IN-PROCESS	OUALIFICATION  ACCEPTANCE	☐ INTEGRATION ☐ SYSTEM	- LAUNCH	OPERATIONS		•
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ı	WIRE FROM PINIS TO S	UBSTRATE (SE	E ATTACHED ME	Maio, HS2	36-75	98)_	
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## SPACE AND COMMUNICATIONS GROUP

## FAILURE REPORT CONTINUATION SHEET

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HU TRACE	GHEE AIRCRAFT COMPANY AND COMMUNICATIONS GROUP	CONTINUATION SHEET LETTER
	AND COMMUNICATIONS GROUP CONTINUATION SHEET	<i>H</i>
	*Label first continuation sheet used 'A', second 'B', and so on	ADDITIONAL FR
	identify entries by referencing fr block number in column, date each entry.	SHEETTISI USED
30	HS 236-7598 WAR WRITTEN PLIES TO RE	TURNING THE
	DEVICE GOD CAILURE ANALYSIS. THE HYPOTHERIS	AT THAT
<u> </u>	TIME (10-26-81) WAS TUAT THE CAUSE WAS	THE SAME
	AS NOTED ON 50860 S/N 8B, WHICH WAS	4 MICSING
ļ	BOND WIRE FAILURE ANALYSIS A DOCUMENT	ENIN
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<b></b> -	PINS 10 AND 13 AS THE UNIT WAS IN	NORMAL
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	CONTINUITY BETWEEN ALL GROUND RETURN	PINISO THE
		FAILURE THAT
	IS PERCETAD HERE AND FATHERING THE	USERS AT
	SPRC HAVE ALSO REEN ALERTED. THIS	SHOULD PRECLU
	RECURRENCE OF SIMILAR PROBLEMS ON	FUTURE
	PROCUREMENTS	
ı —	<u>.</u>	•

HIGHES AIRCRAFT COMPANY

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investigation are given below.

### INTERDEPARTMENTAL CORRESPONDENCE

ro: L. Wolthausen

I DROW SBRC

L. O'Connell

F. Carle

R. Nelson

E. Furuya

past: Failure Verfication Of Thematic Mapper

Silicon Preamp

Hybrid

J. Mazenko

DATE: 11 March 1982

REF: 82/12-60-02-101

604

ORG. COOS: 12-60-01 21218

WAILSTA B253

Thematic Mapper Silicon Preamplifier Hybrid P/N S0860/1950594-100 was returned to the author for failure verification and analysis. The results of the

Initial Failure indication -Open between pins 10 and 13 (Detector Roturn B)

Failure was confirmed by Electrical Test. The hybrid was then subjected to Pind Test, Fine Leak Test and Gross Leak Test. The hybrid passed all of these tests. The hybrid was then decapped for visual inspection. Visual inspection revealed that the wire bond which connects the two conductor traces on the hybrid substrate (see attached photographs) joining pin 10 to pin 13 was fused open.

The actual cause of failure is indeterminate. However, several potential causes are listed below.

- Reversal of hybrid in test fixture.
- Reversal of hybrid on PC board.
- 3. Improper potential applied to pin 10 or 13 during probing or trouble shooting of PC board.

J. Mazenko

Manager Technical Staff

Technical Support Laboratory

Engineering Services & Support Division

## SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

PΑ	HUGHES AIRCRAFT COMP CE AND COMMUNICATION EL SEGUNDO, CALIFORI	S GROUP	FAI	Lure	REPOR		5	8324
T	1. PROGRAM NAME AND NUM	DER TM	2 614	•	FLIGHT	I TIME OBSERVED	S. DATE OBSERVE	01 YR 81
ľ	G. HARDWARE LEVEL G SPA	CECRAFT	SUBSYSTEM		LISSEMBLY RUGASSEMBLY	C) escours	CARD PART	7 1118
ŀ	WAS OBSERVED U. SYS	) ( C41	NAME		PART NUMBER	CI KARCAMI SI SIN		FACTURER
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ľ	ASSEMBLY SUE	ASSEMBLY	man Ban	Jane Da	5079	7 401		<del></del>
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l	OBSERVED IN-	FELOPMENT PROCESS	☐ QUALIFICATION ☐ ACCEPTANCE		TEGRATION (	I LAUNCH OPERATIONS		
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	OF FAILURE CHS	159	FLEGUENC	V RESA	PORISE OUT	SPEG. CH.	1: -3.1 d	3. CH. 5
L	-3.05 dB, C	4.9	3.06 dB A	17 52K	Ha. Swall	60 BE - 3.	bol- as	AB
L	CH'S 2,369	311,12	13 EXCEL		msignt E	ESPONSE S	esc at	10 g 60m
ı	IS. TEST PROCEDURE / 6	597	PARA 7.6	48 10 00	HOLINATION R. Z	080	10-06-8	SHEET USE
L	IS VERIFICATION AND FAILURE ANALYSIS					· •		
Ĺ	·						·	
L								
L					18. FAILED ITEM NAME AND PART NUMBER	3		
L	20. O FOLLOWING REWORKER SEWORK/RETEST NOT R	ITEST REGUIRE ACSO DSRIVOS	use 70 %	she el	med vis	MERKE	en (4)-11.	
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I			21. AU	THORIZATION	Millson	2122	11/9/6/	TO CONTINUATION
	21. REWORK/RETEST ACTION TAKEN			70		G	177	24. ga rewori
i								7
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								•
	23. USY ALL PARTS REPLACED PART NUMBER	CKT SYM	PART LOT NUMBER	BBCO STAC	MANUPACTURER	PROBABL	E DEFECT	ANALYSIS MUA
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ſ	27. REWORK BY		STAD DATE	28. 8	ETESTED BY	ORG	DATE	29. CONTINUAT SHEET USER
Ť	30. CAUSE AND CORRECTIVE ACTION	Jugar	-PAS NECE	noe.	and do	retalle. De	enesen	cia
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	Derotor Conti	nell	Juga Care	motto	Love Spild	31. CONTINUATION SHEET USED	] /////	6 1 18
1	CORRECTIVE ACTION	WII	5 (CP)	ATT	acHED)		1//	17/10/
		ign Ponmental Ective parts	TEST EQUIPMENT TEST PROCEDU TEST SET-UP	IRE	G. PROCEDURE ( SY/FAB ERROA ( ORKMANSHIP	WEAR-OUT	Ú ÚNKNOWN	DEFECT COOL
ſ	S. FAILURE	MARY CED	UNICHOWN  NO FAILURE		38. FAILURE CLASSIFICATION	CRITICAL MAJOR	SAFETY	
ŀ	T RESTROPANTE SAGINEER	7000		1/01	38. SPACECEAFT ACE	EM ENGINEER	13R9 A	DATE /

## Hughes

16060A SC AUG 78

## SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT NINUATION SHEET

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P	EQUIREMENT.	s FOR CROS	STALK. 5 .	711-17-59.4-19	-58 W
5/	6597 PAR	A. 4.6, 4.8	.)		
6 C	. R. Long	22-13	10-01-81		
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### ORIGINAL PAGE IS OF POOR QUALITY Program Instruction 0100 2476 2272: 277 ECCOCOS TOR TREASUREST FALLEY THE 11-10-61 T ALIGNATED THAT AND ADMINISTRATION DIEVER M. KANDELLE DEVIATION X DAILOR SBRC, 75 Coromar Drive, Galeta, Ca. 93117 m1 #GB X way CRITICAL 13. MADE LINE MILCILD 4. SINISHATERN TOW BIV ATTENZWATHER OTHER SISTEMS/CHRICAL DATION LIBOS AFFECTED 16. 561/04:110 % 18. 5Y3. CESIG. Se willed Took 1241 2 414 W-115 n.s 1055 1.57, 5.18 95.254.63.422 BryA AFFECTED CHAPINGL w4. :35% i ٧٠.c., ١٥٥. ١٠٥. 400 CUAS MAIDER ĸγ. 37370 17/4 11727 50797 J. CONTROL Y NO. 4 LINE 1: LA NAS 5-24200 Permission to use Band 2 Band Level Assy SN 401 TT. PARTAGERICAN TO HOMENIA TOTAL T. a. Million appropriation 18. CB =5. Mines United Radiometer II CRITICAL IS. SAME OF THE THEFT STRUCKS WITCESED 17. 101 10 4. 4400 40. 20 1774 00 E 19. OCCURNING DEVIATION VOINTA 50797 Band Level Asay 401 7068 10. CFFEE: 34 3357/\*0.55 · (PPEC" 30 DELIVER SUCCESSE Greater than \$100,000 - it not approved 3 to 4 months if not approved. EL EFFECT DO UNTEGRATED LOGISTIC MPPORT, TOTERFACE, STE NONE 19 merfain, eite ib nente, ifterant nem Permission to use Band 2 Band Level Assy SN 401 will Ch 1, 5, 9 & 13 not meeting frequency response of >=3dR @ 57KHZ (-3.1dB, -3.05uB & -3.06dE respectively); Ch 5, 7 & 9 have non-neighbor crusstalk of -59dB, -59dB 2 -58dB respectively va a ages of <60dB; and Ch 2, 6, 7, 8, 9, 11, 12 & 13 do not meet settling rime requirements. Copy of FR 8324 attached. The rework required to correct the discrepancies noted above is not considered cost or schedule effective.

Miner

Laponna, Artimorana

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Maior/Critical

system cheineering

- Procram Yamager

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# ORIGINAL PAGE IS OF POOR QUALITY

## SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

-	EL SEGUNDO, CALIFORNIA			• •	
П	1. PROGRAM NAME AND NUMBER	2 GLA	FLIGHT 11		DATE OBSERVED 10 /0 DA 26 YR &
	A HARDWARE LEVEL   SPACECRAFT   SU WHEN FAILURE   SYSTEM   UN		SSEMBLY O MODI	JEE .	CARD PART
	EQUIPMENT IDENTIFICATION:	NAMS	PART NUMBER	S/N	MANUPACTURER
l	7. SUBSYSTEM				
	8. UNIT	<del></del>		+	
	S HASSEMBLY SUBASSEMBLY RAND	ADST AM	50904-1	101	SSAC
Ö	10. MODULE I MICAM I CARD	1 DAS LARA	30/04-1	+ 70 /	exact (
MA	11. OTHER			<del>-  </del> -	
ORIGINATOR		LIFICATION D IN	TEGRATION   LAUN	H OPERATIONS	
0	OBSERVED AIM-PROCESS LACO		STEM [		
	WHEN FAILURE   = AMOIGNET	ANTION AXIS			ARS AT
	14 DESCRIPTION TRANSIENT	ESPONSE	VERY B	4D	
			1		
	18. TEST PROCEDURE 16597	PARA IG OF	AVISON I		ATE 17. CONTINUAL D-26-8/10 SHEET USE
Z	18 VERIFICATION AND FAILURE ANALYSIS RESULT OR S	P77 (	ROLLOFF 2	TENER LES	-259) AND
2	R 88 ( GAIN 6,34K	- 763	ARE R	EVERSE	DaNO
S	NUPREMENTS ACCURATED.	FE UST	36-7743	OPU ATTRO	licb
EVALUATION			IR FAILED ITEM HAME RA	1) 1 6)57	- AMP 60 5090°
	20 A FOLLOWING REWORK/RETEST REQUIRED P	2.000	R72 AND	000	سيريب أبيريت بمسيدة بتنازع والمنطق بسناه بمناه المطابع
200	REWORK/RETEST NOT REQUIRED DECAUSE	EVERSE	K KG PRIGO	RBB	AND
EXCIMEERING	KETURN 10 PINAL	TEST,	<del></del>	<del></del>	
2		Wir Cally	ASAA A	108G 0	ATY 26 - 84 0 SHEET USE
_	ZI REWORK/RETESY 3 73 60			Continue 1	0-24-84 G SHEET USE
TEST		(3K) AND R	EDIPRESENTAL G.	TRI WAR	1810-0
-	INSTRUMED IN THEIR PROPER	LOCATIONS a	NO ONE BILLE	S OSSUA	24 OA/ISTEST
AND					77.2
RING	M. UST ALL PARTS REPLACED				<u> </u>
STOR!	NONE (NO OVERS PERS		MARUFACTURER	PROBAGLE DEF	
۶	100	OCCURRED A		0 - 014 0	(STB)
2	INTERCHANGE REF AS Z.	20-1110-2 DE	ED 11-70-81	COLAVIDA	CHED)
W W	Z7. REWORK BY CRG	DATE 23. A	ETESTED BY	ORG	ATE 29. CONTINUAT
╣	30. CAUSE AND				<del></del>
٠	CORRECTIVE ACTION WORKMANSHIP	AP 3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	MOVING SELEC		
ł	FROM STANDOFFS TO THE			33	SED TO USE CAR
ح	WHEN REMOVING AND REI	USTALLING C	M PONENTS		ı
5					JV.
\$					ا تقمیم ا
H			31. CO	VINUATION	1810, 2
ջ	2. DOCUMENT IMPLEMENTING	11. 22/ 72		EET USED	1/1/01/1/01/01
5	CORRECTIVE ACTION NEWSCORD		43 CAPY ATTAC		UNKNOWN DEFECT CODE
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## SANTA BARBARA RESEARCH CENTER A Subsidiery of Hughes Aircreft Company

### INTERNAL MEMORANDUM

934/

TO: L. O'Connell

CC: See Distribution List

DATE: 20 November 1981

HS 236-7743 REF:

REAE 81/64 A. Buber

SUBJECT: Subject: FR: S8341

(Band 1 Postamplifier Bd.

50904, Flt)

BLDG. B-11 MAIL STA. 102

6246 EXT.

FROM:

FR: S8341, Dated October 26, 1981

The failure was encountered during retaut of Rend 1, Channel 15, ofter select resistors were reserved from standoffs and placed directly onto the board. It was found that the pregain resistor R88(6.34K) and rolloff resistor R72 (24.3K) were interchanged. The resistors were subsequently resoved and reinstalled in their proper locations. Figure 1 illustrates the postamplifier pregain and rolloff stages. In general no overatress will occur as a result of as interchange of premain and postmain resistors. The postmaplifier has been designed so that any intermediate amplifier stage can naturate without causing a condition of overstress.

AH: jc

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ORIGINAL PAGE IS OF POOR QUALITY 242 Program Instruction 010 PROCURING ACTIVITY KO. SATE PREPARED PROUEST FOR DEVIATION/WALVER ISEE WIL-STD- 440 OR 41 FOR INSTRUCTIONS 1. SELGINATOR WANTE AND ADDRESS David M. Randall DEVIATION X PALVER SBRC, 75 Coromar Dr. Goleta, Ca. 93117 BONIM X מסנגעט CRITICAL SESIGNATION FOR DEVIATION/BAIVER CTHER SYSTEMS/CONFIGU-BATION ITEMS APPECTED 5. BASE LINE AFFECTED 4. MOCELIT X TIONAL X ∞ 11323 W-118 723 PECIFICATIONS AFFECTED TEST PLAN CRACINGS AFFECTED uf8. :::E SPEC./ DOC. 40. SCIS ₩9. C30€ MARKER ACY. 402. NO. . SYSTEM 11323 50795 Ħ b. 1754 C. TEST PLAN S. CONTRACT NO. & LINE ITEM NAS 5-24200 Permission to use PFPA with Band 4 Ch 16 noise of 2.8 pA II. CONFIGURATION A. JEFECT CLASSIFICATION Radiometer X withou II CRITICAL الله الله IS NOT OF PART OF LEGIST ASSESS, A MELCINA 4. PART SO. OR TYPE SERIE 17. LOT 40. 9. PECEPRING DEVIATION/ VALVER 7485 **T** \*\*\* 50797-E 401 Band 4 Band Level Assy 1 20. EFFECY ON COST. PRICE 2). OFFICY OR OFLIVERY SCHEIN Greater than \$100,000-if not approved. Eight weeks if not approved. 22. EFFECT ON INTEGRATED LOGISTIC SUPPORT. INTERFACE. ETC. None 23. DESCRIPTION OF DEVIATION WALVER Permission to use Flight PFFA with Band 4 Ch #16 noise of 2.8 pA. (Ref. FR \$8342) Specification is  $\le 2.4$ pA. Analysis indicates that the Radiometric sensitivity requirements will still be met at the systems level. A. HEED FOR DEVIATION MAIVER The alternative is to take the FPA Assy apart; take Band 4 apart and replace the detector. This operation is risky and since the reason the detector became noisy is unknown, there is no assurance that the replacement detector will perform any better or be more reliable. PE 3-8-82 003 51065 SN 003 ONW CMD Minor - System Saginacting
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\$3. DESCRIPTION OF DEVEATION WATER

Greater than \$100,00-if not approved.

Band I has a number of channels with transient/frequency response discrepancies as defined by FR 8440. Attached is a copy of FR 8440 and trunslent response plots for all channels. Channel two has average crosstalk between non-neighbors of -59dB vs a specification of ≤-60dB.

Six weeks

Band I has been bonded into the FPA sasy and discrepancies are not considered signif: enough to warrant rework on a coxt/schedule impact basis.

REA MIKONDAL SYS ENGR 1	Charles Herry Holling
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### SANTA BARBARA RESEARCH CENTER A Subsidiery of Hughes Aircraft Company

### INTERNAL MEMORANDUM

TO: L. O'Connell

CC: W.D. Adams

DATE: 19 March 1982

Altman

REF: HS 236-7901

G. Gritt. D. Randall

PE 62:82

SUBJECT: Use of Silver Epoxy for

Sciacca

FROM: A. Perline

Electrical Connections

(Ref. Deviation D-142)

BLDG. B-11 MAIL STA. 39

EXT. 6106

The undersigned has completed a review of the use of silver epoxy for electrical connections on the spare silicon detector and preamplifier assembly (P/N 50797).

### The results are as follows:

- 1. The bonding will be performed in accordance with SP 80141. Paragraph 6.1 specifies intended use is to achieve electrical conductivity between electrically conductive parts.
- 2. This bond will be used on three leads only.
- 3. The wire is 0.001 in diameter and has a loop height of 0.010 in max. The inertia of this loop is extremely small and will pose no problems in vibration. This problem was reviewed at the time of replacement of platinum wires with gold in the CFPA.

A. Perline, Reliability Engineer

Thematic Mapper Program

AP:jc

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ORIGINAL PAGE IS Program Instruction 010 OF POOR QUALITY, PROCURING ACTIVITY NO. REQUEST FOR DEVIATION/VALVER SATE PREPARED 10/19/81 RIGHAIDA HAME AND ACCRESS D.M. RANCALL OEVIATION X PAIVER SBRC, 75 Coromar Dr. Goleta, Ca. 93117 3. X MINOR MAJOR CRITICAL 4. OTHER SYSTEMS/CONFIGU. DESIGNATION FOR DEVIATION/MAIVER 15. HASE LINE AFFECTED SYS. SESIG. 11323 . RO ¥-112 YES S. DRAWINGS AFFECTED SPECIFICATIONS AFFECTED - TEST PLAN WR. CODE WFR. CSOE \$PEC./00C. 40. NO DEPOSED FEY. NGP. NO. 50795 11323 H e. SYSTEM . 6. ITEM TEST PLAN 9. That of the Annual Permission to continue thru PPA assy 50795 with 10. Caract No. 6 Cine 178 Band 3 Ch 9 Wide Band Noise of 2.9 pA. NAS 5-24200 IT. CENTIGURATION I YOU WOUNCLATURE 12. CD NO. SEFECT CLASSIFICATION Radiometer II Жикоз Пилов CRITICAL S OF PART OR LONGET ATTEMPT AFFECTED ACT NO. SO TYPE DESIG 17. LOT 40. 9. ACCURSING DEVIATION/VOLVED 50797-E Band 3 Band Level Assy 401 X ma IS. UPPLEY ON COST/POICE . EFFECT ON DELIVERY SCHOOLS \$45,000 if not approved Two weeks if not approved. 12. LIVELY ON INVESTATED COGTSYIC SUPPORY, INTERPACE, EYE. None 23. DESCRIPTION OF DEVIATION WAIVER This waiver requests permission to reconnect detector lead Band 3 Ch #9 via silver epoxy, test and assembla into F-1 PFPA assy 50795 with Ch 9 wide band noise of 2.9 pA. ZA. NEWD FOR CEVIATION VAIVER The alternative is to take the band level assy apart and replace the detector array. This operation is risky and since the reason the detector became noisy is unknown there is no assurance that replacing the detector will result in better performance or reliability SYS ENGR 003 CMO Minor - System Major/Critical Program Hanager JAPODOVAL, DISAPDOOVAL APPROVED DISAPEROVED SPERGYAL RECOVERAGED 10/50/24 NASA C

DD . 27. 1694

H	UGHES		INTERDEPART	MENTAL CO	RRESPONDE	4CE	CIPE
. *	TO: CHG.	R. J. Wilkerson 51-41		. C. Long . A. Keffer . O'Connell		DEF.	15 October 1981 7621-21/276
	SUBJECT:	Senaing of Guid				FRÜM: ORG.	K. 4. Boyle
•		:				elsg.	37 6 MARL STAL R

A recent problem when bonding a 1 mil gold wire to gold platual quartz has resulted in an electrically noisy bond joint. It has been suggested that the silver-fyliad apoxy used in accordance with 5% 80140 be requiredly removed and trash epoxy applied to form a better bond. Because of the removed and trash epoxy applied to form a better bond. Because of the wire, it would be difficult to completely manove all of the cured epoxy. Questions arose as to the integrity of such a secondary bond on top of a cured adherive.

In this instance, there seculd be no problems with this bonded joint. The only load on the wire is its weight. The bondline will be makely at cocaying epocy coupling as opposed to an optimum epoxy/gold bond. However, this section tond should be adequate for this applications

There may be some degradation in the thereal transfer capabilities, but it is downtrat that it could be mensured. This resort procedure is strictly recommended furthis problem and should not be used in general practice.

K L Core

O. T. Comm. Stand Adhesives and Dielectrics Section

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ORIGINAL PAGE IS OF POOR QUALITY Program Instruction 010 ROCURING ACTIVITY NO REQUEST FOR DEVIATION/VALVER ISEE VIL-STD--40 OR -41 FOR INSTRUCTIONS) CHIGHNATOR THE AND ACCRESS David M. Randall DEVIATION Y GALVER SBRC, 75 Coromar Dr., Goleta, Ca. 93117 X UINOR CRITICAL MAJOR SES-GNATION FOR DEVIATION/ GAIVER S. JASE LINE AFFECTED STHER SYSTEMS/CONFIGURATION ITEMS AFFECTED SYS. JESIG. A. WOEL/T WED. COSE d. HEY/WALVER 11323 W 114 725 X 40 TM AFFECTED PECIFICATIONS AFFECTED FIEST PLAN CONTWANCS WFR. IDCE \$₱€C./00C. ₩0. 4FR. C30E NOR. NO. SEASON P REV. . SYSTEM . 1784 50795 S. DATRACT NO. & CINE ITEM NAS 5-24200 Permission to proceed with Band 4 Ch #16 noise of 2.8 pA II. CONFIGURATION . "EN HOMENCLATURE STATE OF STATES 12. CD 40. Radiometer ROLAN MONIN II CRITICAL IS. NAME OF POOT OR LONGST ASSESSED WEECTED. OT 40. 00 TYPE 2551 9. -COLERING DEVIATION/PAIVER 7. LOT NO. 50797 - E Band 4 Band Level Assy 401 X 100 1 YES IO. LEFECT ON COST/PRICE 1. EFFECT ON SELIVERY SCHEDULE \$80,000 if not approved. Four weeks if not approved. II. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC. None 23. DESCRIPTION OF DEVIATION WAIVER This waiver requests permission to proceed with assy, and testing up to completion of the Flight PFPA with Band 4 Ch #16 noise of 2.8 pA. The alternative is to take Bands 3 and 4 out of the FPA Assy; take Band 4 apart and replace the detector. This operation is risky and since the reason the detector became noisy is unknown, there is no assurance that the replacement detector will perform any better or be more reliable. SYS ENGR 003 Minor - System Engineering Major/Crisical -Program Manager TSBUDART. SISTEDOUATE -----

APPROVED

NASA SSEC

DD :: 1694

DISAPPROVED

10/19/2

Program Instruction 0100 2470 2252: 255: የርጭርያ፤ ፕሮዕራ ጊህ እን ተያስለለት የያለየውን ጥልታ 11-10-61 Michigante come and ancients Division of Killian I PALLER. SEVIATION SBRC, 75 Coromar Drive, Goleta, Ca. 93117 X HAUD CRITICAL 4. STATEMATORS ON DIV ACCONTRAINER 13- HABE LINE MITECILE e. 573. 2851G. W-115 Taria Trea-11323 M 1950 1104" CHE AFFECTED-TEST FLAV 8. CHAMINGL AFFECTES بدر.. <u>۱۹۵۰</u> ۱۹۵۰ 44 A. 1201. 458 COOE M-HOCR 37.5700 . : 6. · \*\*\* E 11323 50797 "F3" PLAT NAS 5-24200 Permission to use Band 2 Band Level Assy SN 401 TO CONTRACTOR OF THE HOME HE STURE 112. 25 שניייות עו Radiometer II CRITICAL ig. the se care of tarter restrict wellets ACCIRCING DEVIATION TAIVER Band Level Asav 50797 401 المارات ا X m The Parties Greater than \$100,000 - if not approved 3 to 4 months if not approved. EL STEET DE VITEGRATED CONTENT METORE, INTEREME, STE NONE Permission to use Band ? Band Level Assy 38 401 with Ch 1, 5, 9 & 13 not meeting frequency response of >=3dR @ 57KHZ (-3.1dB, -3.05dB & -3.06dB respectively); Ch 5, 7 5 9 have non-neighbor crosstalk of -59dB, -59dB & -58dB respectively ver a spec of <60dB; and Ch 2, 6, 7, 8, 9, 11, 12 & 13 do not meer secriting rime requirements. Copy of FR 8324 attached. The rework required to correct the discrepancies noted above is not considered cost or schedule effective. - Jystem indineering Critical - Program Manager nor. e icr/Critical I LEPTOTAL ALL MOUNTED DD ##..1694

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SBRC, 75 Coromar Dr., Goleta, Ca. 93117    Control   Con				DATE PREP	Cl. J.	33	PROCURING AC	TIVITY NO.	<i>F.</i> • <i>U</i>
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Permission to use Band 4 Postamp with Ch 6 frequency response -2.24 dB down vs a specification of -2.5 to -3.0 dB down at 52KHZ.  This parameter is in violation of a unit level specification; not a system specification of -2.5 to -3.0 dB down at 52KHZ.  Permission to use Band 4 Postamp Fig. 18.  With for structure and the second of the structure and the specification of -2.5 to -3.0 dB down at 52KHZ.	MGCEL/TYPE		e. SYS. CESIG.	i	C FLANC.	- ALLO	F 2000.		-TH
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Program Instruction 010 TATE PREPARED REQUEST FOR DEVIATION/VALVER PEDCLAING ACTIVITY NO. SEE VIL-STD-- 40 OR -41 FOR INSTRUCTIONS) 1. CARCUMATOR THAT AND TOTALESS DAVID M. RANDALL IX VALVER SEVIATION SBRC, 75 Coromar Dr., Goleta, Ca. 93117 X WAJOR MINOR CRITICAL DESIGNATION FOR DEVIATION MAINER S. BASE LINE AFFECTED #. OTHER SYSTEMS/CONFICUL-RATION LITEMS AFFECTED . WODEL! TYPE X FUNC. X 11323 TM W-126 F SPECIFICATIONS AFFECTED-TEST PLAN 3. DRAWINGS AFFECTED WFR. 1008 SP EC./2000. NO. 4.4864 PEV. WFR. CODE 408. 40. e. SYSTEM S. ITEM 11323 50795 TEST PLAN . 9. . ITLE OF SEVENTION/ MAINCA O. CONTRACT NO. & LINE ITEM NAS 5-24200 Permission to use PFPA with Band 1 miscligned. II. CONFIGURATION LIEM NOMENCLATURE SEFECT CLASSIFICATION X MINOR WALDR CALTICAL Radiometer II IS. HANG OF PART ON CONEST ASSCHREE AFFECTED FECURRING DEVIATION/ MAIVER 17. LOT 40 X 100 003 763 Si Focal Plane Assy 50795 21. EFFECT ON DELIVERY SCHEDULE Greater than \$50,000 if not approved. Four weeks if not approved. 12. EFFECT ON INTEGRATED LOGISTIC SUPPORT. INTERFACE, ETC. Misalignment must be taken into consideration. 23. DESCRIPTION OF DEVIATION WAIVER Band 1 is located .102961 "to .102977" from Band 2 in the "Y" dimension vs a drawing requirement of .10200" + .000150". This will result in a misregistration of .24 JFOV; this misregistration will have to be taken in to consideration by ground processing of TM data. 24. HEED FOR DEVIATION/ TAIVER To correct this, misregistration will require the removal and realignment of Band 1 Band Level Assy. This is a difficult and risky operation. It is not considered cost or schedule effective to repair. 51065 SN 003 CNLY Minor - System Engineering Major/Critical - Program Manager JAVOPORE C . JAVOPORAL VIPOGOVED DECEMBERS AND PROPER DISAPPROVED CCR +0355

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ORIGINAL PAGE IS OF POOR QUALITY Program Instruction 010 SATE PREPARED REQUEST FOR DEVIATION/WAIVER (SEE UIL-STD-460 OR 481 FOR INSTRUCTIONS) 27 March 1982 I. ORIGINATOR HAME AND ADDRESS. X BALVER DEVIATION Santa Barbara Research Center A RIMON MOTOW CRITICAL 75 Coromar Drive. Goleta. 8. OTHER SYSTEMS/CONFIGU-RATION ITEMS AFFECTED 4. DESIGNATION FOR DEVIATION/VAIVER 6. KSDSL/TYPE b. MFR. COSE e. SYS. DESIG. X NO Flight W-148 TICHAL CATED 753 11323 7. SPECIFICATIONS AFFECTED-TEST PLAN 8. DRAWINGS AFFECTED MFR. COCE SPCC./00C. 100. 201 MFR. CODE MARGER NOR. NO. e., SYSTEM 11323 TP32015-506 Rev D . ITEM TEST PLAN . TITLE OF DEVIATION DAIVE Waiver on tolerance of Prime Focal Plane to scan direction alignment, NAS-5 2400 II. CONFIGURATION ITEM HOMENCLATURE SSIFICATION OF SEPECT 12. CD NO. IAO6R test X Assect IR. DAME OF PART OR LOCKET ASSOCIAT AFFECTED B. RECUERING DEVIATION DAIVER 14. PLAT HO. OR TYPE DESIG. 17. LOT NO. TYES X 52532 N/A IAOGR test II. EFFECT ON DELIVERY SCHEDULE 20. EFFECT ON COST/PRICE None None 22. EFFECT ON INTEGRATED LOGISTIC SUPPORT. INTERFACE. ETC. 23. DESCRIPTION OF DEVIATION VALVER Scan direction to prime focal plane array angle is 0.74mrad. The IAO6 test procedu targets ±0.5mrad. [Paragraphs 1.1 and 5.1.14] This deviation will not affect our ability to meet the relevant system level specifications on band to band registration. An angle of 0.74mrad corrosponds to an along track BBR error of 0.06 IFOV between bands 1 and 4 (spec. is ±0.2IFOV) and 0.12 between bands I and 5 (spec. is ±0.3 IFOV).

24. WEED FOR DEVIATION/ DAIVER

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		SUPPLICATION 10. AIM DATED 4/ SUPPLEMENT REL	DATE 3/29, IDDIT TO PRODUCTICE: UPON RECEIPT, CUSTR NO. AND RECEIPT DATE SHEET OF AHR. PUTHA		BY	2/2/2		11.4/02	1/53/1					1/20/63		· .
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	ASSEMBLY HISTORY RECORD	ASSY	THE R.E.A.	ginal AHR. this test is to ensure that project stores incomplete. not available for testing v	INSTRUCTIONS	Q.A. & A.F. before testing	& A.F. MILL POIL		spec #16306 Rev J & EO'		Attach all test data to			on verify test data from oper		URN TO MAIN AHR OPERATION S
	····	50797 - 2 501  50797 - 2 501  511 ICO11 DETECTOR PREAMP	ADDITIONAL TESTING PER	Same as original Reason for this assy, into proj Postamp PVB not	•	1) Notiry	Q.A. (112		2) Test per	3047A.	*NOTE:		•	Inspection		RETURN
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ORIGINAL PAGE IS

Response for each focal plane channel at the following frequencies:

· .			
1 kHz	2 kHz	S kEz	10 kuz
ch 1 <u>3</u> db	-1.0 db	- <u>- 3.7</u> ab	mes line
133	8	<u>- 3.5</u>	-7.8
35 <del>-2.</del> 3	-1.0	- 3.9	<u>- 8. 3</u>
47 2	8	-3.7	<u>-7.9</u>
57	<u> l</u>	9	-3.3
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8/5		· · · · · · · · · · · · · · · · · · ·	
73 ——			
20 LHz	50 kAz		
ch 21 - 13.7 db	-22.   db		
23 -/3.4	-21.5		
as -13.8°	-21.8		
47 -13.6	-21.4	Test Enginee:	CR L
59 - 7.9	-16.2	••	4-28-82
\$1 -12.6	-20 2		
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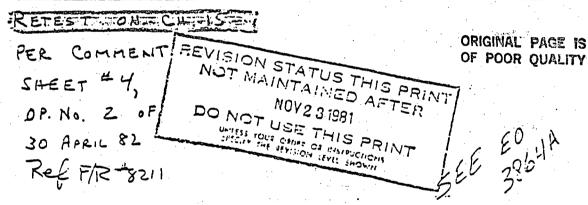
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710 PART PART ASSY/LOT SERIAL NO. 110. OPER OPERATOR DATE COMMENTS, TEST DATA, ETC DISPOSITION ATTROVAT OR JHSP 110. Sir 182 VOIDS IN SILVER EPOXY ON CY 7 1260 TRACE 412/82 5/ 80/41 REVC ORIGINAL OF POOR PAGE 18 501117 1/24/22 圖 FR 80 11. CH 15 NO RESTINGE O.C. OFFICET ISTINO 2601 8 2.11 9/30/82 Waster Itel 10 70 C m /acce 200 hours

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, , , -		REVISIONS		
•	SYM	DESCRIPTION	DATE	4000
~		INITIALLY RELEASED 9-5-78		
RST USE	מ	Completely revised and retyped to incorporate new system specs & update test procedures. As required by ECR TM1103/01.	12-6-79	2-11
SER. No. 12 & SUBQ	.E	Incorporated EO 1610	80 <i>-8-29</i>	2.3
51065 SER. No 002 & Subq.	F	Paragraph 4.6 added: Transient response gold wires are not damaged. as req by ECR TM 1913/01.	80-09-1	is f
51065 5/N CC3 5/N CC3	G	Incorporated E. O. 2149A	12-2-30	S.
1065 SII 13 & SUGQ	Н	INCORPORATED ED 2960A.	21-4-20	WW =
1065 S/N & SUB:		Changed by Revision Notice per ECR No. Th 2339/01	81-5-22	NC) =



CONTRACT NO. NAS 5-24200	SANTA BARBARA RESEARCH CENTE:  A Subsidiary of Mughes Aircraft Campany  GOLETA, CALIFORNIA					
CHECKED A 11-1-77	TEST PROCEDURE FOCAL PLANE PREAMP ASSEMBLY					
Marie Constitution of the	A 11323 NUMBER 16306					
	SCALE SHEET 1 OF 12					

						-
4.5	Respon freque	se for eac	h focal plane	channel at th	e following	• !
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		1 kHz	2 kHz	5 kHz	10 kHz	
	Ch 1	db	db	db	db	
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4.6 Boosted Frequency 100 Hz	Response:	2 kHz	5 ki!z
Limits (db)	<u> </u>	±0.5	+0.5
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3			
4			
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K15 0	<u>-:/_</u>		.04
10 kHz Limits (db)	20 kHz +0.1 -0.9	52 1:11z > -3	
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Design Engineer _		Date	
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3			
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OVERSHOOT		Li	mit: 10%
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PEQUEST FOR DEVIATION VALVER PATE TIL-STD-140 CS LAT FOR INSTRUCTIONS) I. CRILINATOR NAME AND ADDRESS GEVIATION David M. Randall SBRC. 75 Coromar Drive, Goleta, CA 33117 X mylos MINGE CRITICAL DESIGNATION FOR DEVIATION/WAIVER S. HASE LINE AFFECTED ANTION LIGHT AFFECTED SYS. CESIG. ਲਵ. ਹਰਫ਼ 11323 e. WOCELL TYPE TM W-155 PCOO | ka TI ONAL CATED 748 Soare SPELIFICATIONS AFFECTED-TEST PLAN . DRAWINGS AFFECTED MFR. C091 1970. CODE \$PEC./000. KD. SCH MARKE B REV. HQ27. NO. S) STD 50797 11323 . 1754 E TEST PLAN IU. CONTRACT NO. O LINE ILLE Permission to use band level assembly S/N 501-1 NAS 5-24200 TE PROJECTION TO NOMENCLATURE MAJOS THE MINES CRITICAL Radiometer IS. RECURRING DEVIATION/WAIVER 7. LOT NO. ID. OTY 725 50797-€ 501 Band Level Assy. 10. EFFECT ON CAST/PRICE None if approved None if approved EL. EFFECT ON INVEGRATED LOGISTIC SUPPORT, INTERPACE, CTC. None 23. DESCRIPTION OF DEVIATION WAIVER Band level assy. S/N 501 has out of specification transient responses for Ch 1, 5 7 and 15 per FR 8212. A copy of the FR and transient response plots are attached. 14. HEED FOR DEVIATION WAIVER The band level assy, is completed and would require a high degree of risk to the quartz substrates to take apart to rework. The \$15K Si detector would have to be replaced and there is no guarantee that rework would result in better performance. Rework is not considered cost effective. ES. PRODUCTION EFFECTIVITY BY SERIAL NEMBER 51063 SN 004 CNLH WINDKIZING SICHATURE APPROVED APPROVAL RECOMMENDED DISAPPROVED GOVERNMENT ACTIVITY 3-1134 DD . 1594

#### HUGHES

#### SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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#### HUGHES

#### SPACE AND COMMUNICATIONS GROUP

HUDMES AIRCRAFT COMPANY.

SPACE AND COMMUNICATIONS GROUP

EL ERFUNDO, CALIFORNIA

#### **FAILURE REPORT**

**S** 8231

-	EL ESFUNDO, CALIFORNIA					
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#### SPACE AND COMMUNICATIONS GROUP

HUGHES AIRCRAFT COMPANY SP-12 AND COMMUNICATIONS GROU EL SEGUNDO, CALIFORNIA

#### FAILURE REPORT

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COLD FOCAL PLANE/COOLER CABLE

Listing of Liens

# COLD FOCAL PLANE/COOLER CABLE P/N 50973

ORIGINAL PAGE IS OF POOR QUALITY

#### FLIGHT

Failure	Reports	Number
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Failure Repor	rts Number
Open	Closed
S8213(Spare)	F2387
S8218(Spare)	F2664
•	F2665
	F2667
	S8018
	\$8205 .
	S8207
	S8208
	S8209(Spare)
	S8219
	S8225
	S8226
	S8230
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#### COLD FOCAL PLANE

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(Spare)		·	F0610		
	S8018		F0614		
	S8205		F0615		
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	S8328(Spare)		F1727		
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successfully on	PF and F.		·			102	50974	_	
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DUPLICATE MASTER

) Progress Instruction 010 PERSON FOR COUNTY OF PERSON THE VILLED OF ALL AND LESSEE THE Carrie M. Mengall - ATTION 🗵 😊 🖂 SEEC, 79 Carmear Drive, Coleta, CA. 93117 C2184 4 Desicustica FOR SEVIATION DATARR S. DESE LICE OFFERED e. 178. CARIO. 11323 39401467 RECC: 10 MAJA SSILBATO 13 V. 11323 Progue **ZHZDA** A 1F(3) 50973 1001 G 47s. Perciseios to Acocable 2006 7 Decerce with Binarapane Boad & Desector. MAS 5-24200 II. CONTRACTOR TO SERVER STORY 2000 TE. CJ 53. Redicases المستعدات المستعدد CON PROSE J. LCH Sed\_\_\_ Could Possi Flass Acoy 30973-B 201 B. WALT WEST STORY II. EUUGER S.W. (NO) 17 not approved. Two weeks if not approved.

L CENTRE OF CENTRE FOR VICE

This univer requests permission to promot then numbing, virolating and tasting the lead 7 detector with a discrepant band 3 detector still an the FFA. The land 9 detector has had conductive openy repair of open traces on Ch 10 6 12. Channel 10 legs a shorted descript of the pour repair. All other channels. Including the openions.

IN COM THE GENTLIGHT CONTROL

De FFA bas had exzerous detector changes and further detector changes could result to loca of the entire FFA. This entury will allow evaluation of the lead 7 detector before deciding election to replace the lead 5 detector.

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ORIGINAL PAGE IS OF POOR QUALITY Program Instruction 010 REQUEST FOR DEVIATION/WAIVER DATE PREPARED IST E WILL-STD-+40 OR -41 FOR INSTRUCTIONS) I. TRIGINATOR NAME AND ADDRESS MOITAIVED X WALVER David M. Randall X MINOR SES: GNAT: CH FOR DEVIATION/WAIVER BASE LINE AFFECTED X TIONE ∏्राल्य 11323 TM W-110 SPECIFICATIONS AFFECTED-TEST PLAN 8. DRAWIFGS AFFECTED WER. COCE SPEC./COC. NO. 11323 2870A 0. SYSTEM 1 TEM That is the conserver Permission to test and repair discrepant NAS 5-24200 Band 7 Detector. II. CONFIGURATION ITEM TOMERCLATURE Radiometer X mires IS. WELL OF PERT OR CAREET ASSESSED MOSCITE 50973 **- B** 201 1 Cooled Focal Plane Assy IO. CFFECT ON COST/PRICE II. OFFICE Two weeks if not approved \$30,000 if not approved. 12. EFFECT ON INTERMATED CONTAINS SUPPONT, INTERPACE, ETC. None 23. DESCRIPTION OF DEVIATION WAIVER This waiver requests permission to test end then repair discrepancies described in NEW 27775 - NOR 277751 Coptoo of NOR o are recentled. The Results of This TEST AND Physical examination of All remaining detectors in STOCK (Flight stores) was be reviewed with NASA proce to repair and test. 14. NEED FOR CEVIATION CAIVER The FPA has had unmerous detector changes and further detector changes could result in loss of the entire FPA. This waiver will allow evaluation of the Band 7 detector before deciding whether to replace it. SYS ENGR 003 Minor - System Sodineer 202 Major/Critical - Program Manager APPROVAL, DISAPPROVAL

DD . 32. 1694

#### NOTICE OF REVISION (NOR)

W-110-R1

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This revision described below has been authorized for t		listod.	
CONGINATOR MANE AND ADDRESS	DATE	me cont	198. ng.
D. Randall	9 Oct.'81	11323	2870A
I TITLE OF DOCUMENT	3. 600. COSE	4. 20CLMSh	B)CENT
Permission to test and repair discrepant Band 7 Detector	e. Pevision c	50793	1. (C) cd.
7. CONFIGURATION ITEM FOR SYSTEMS TO WHICH ECP APPLIES			CLASS
Cooled Focal Plane Assy.			Minor

. DESCRIPTION OF REVISION

Test results are acceptable. Request permission to repair and retest as required.

REALITEDING FOR D. Road	SYS ENGREMENT OF JENGELDE ATW	elpen 1
	9. THIS SECTION FOR GOVERNMENT USE ONLY	
CHECK CONG  ENGINEER TO CONCERN SEPPREMENTED BY THIS  ENGINEER WAY BE USED IN MAGGINETURE.	ESTITUTED OCCUPANT MIST BE RECEIVED BEFORE  MASSIFACTURES MAY INCOMPORATE THIS CUMPEL.  CHECKLES AND PROSPER REV	
8. ACTIVITY BITHOGRIED TO APPROVE CHANCE FOR COVE	Transfer and Trite	DATE
NASA - 65FC	Umos Contra planadi	10/9/81
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NONCONFORMING MATERIAL REPORT (NCMR) HUGHES WALLES AIRCRAFT COMPAN FPRG PROGRAM ID \_ 1/012 NOMENCLATURE PART NO. S/N ENG. CHANGES 201 CFP Assy (Band 7 wive bonding 50973 REF. DOCUMENTS MRCO OTY. SUSP. SUSPENDED IN HARDWARE I.D. NO. WORK ORDER DOC NO. LOT SIZE MR 5097 3 Suppl 57 Oper 31 /MOrocess SUPPLIER DIV. OR LOCATION SUPPLIER CODE P.O. NO. OTY INSP. PRIOR HEM OTY SUSP. RESP. DEPT. M.N. LEVEL DESCRIPTION OF NONCONFORMANCE CODE NO. G MRS BRRC - no visible line of 0 SAAC MES 0 MEA SRR( ORIGINATOR A ENGINEERING TIEM NO. DISP DISPOSITION/INSTRUCTIONS STAME CODE ENGINEERING HEM RESULTS OF CORRESTIVE ACTION INVESTIGATION CAUSE OF NONCONFORMANCE ORIGINAL PAGE OF POOR QUALI is organized QUALITY DATE ANG DEBIT VENDOR DISP. CODE VENDOR PACKING SHEET COPY OTY. A.T.V. OTY. SCHAP QUYERS SIGNATURE Ö WENDOR! HAC YES  $\cup$ 11628 CS OCT DISTRIBUTION: 1. Original: 2. Copy: 3. Copy: 4. Hard.

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#### GENERAL FLOW OF DISCREPANT Insb Detectors

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#### per Waiver W-113

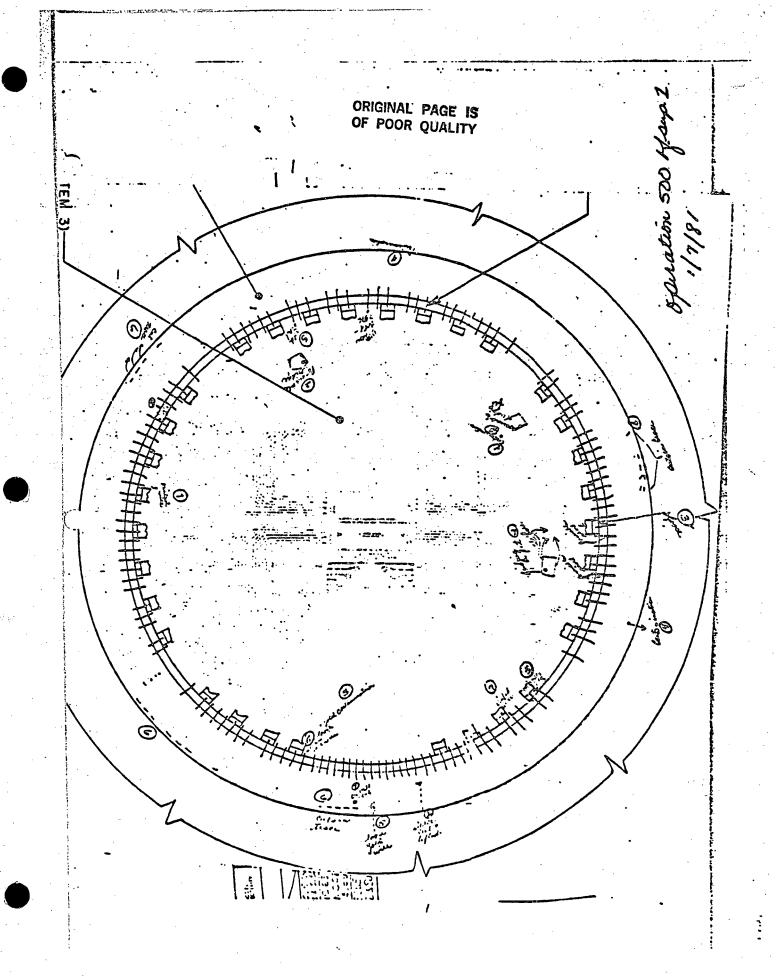
- The four array's will be inspected and each defect (crack) will be measured and a photo taken of the array.
- 2. The array's will be subjected to 10 temp. cycles ambient to liquid nitrogen.
- 3. Visually inspected and photographed.
- 4. One will be selected for mounting on the CFPA and mounted.
- 5. Visually inspected/photographed
- 6. Temperature cycled 10 times in a dewar.
- 7. Visually inspected/photographed.

ORIGINAL PAGE IS OF POOR QUALITY DATE PREPARED REQUEST FOR DEVIATION/WAIVER FOCURING ACTIVITY NO. (SEE MIL-STD-480 OR 481 FOR INSTRUCTIONS) 1. ORIGINATOR NAME AND ADDRESS David M. Randall DEVIATION RIVIAG TA SBRC, 75 Coromar Dr., Goleta, Ca. X MINOR KAJGA CRITICAL 4. DESIGNATION FOR DEVIATION/WAIVER 5. BASE LINE AFFECTED OTHER SYSTEMS/CONFIGU-RATION ITEMS AFFECTED MFR. CODE e. SYS. DISIG. e. MOXILITYPE X PUTEC. YES X 190 11323 Spare SPECIFICATIONS AFFECTED TEST PLAN 8. DRAWINGS AFFECTED MFR. COST SPEC./00C. NO. NESESER. SCH KETTI. CODE REV. MOG. NO. 4. 515104 2444A, 3121A 50955 . ITEM 11323 TEST PLAN TITLE OF DEVIATION WAIVER 10. CONTRACT NO. & LINE ITEM Permission to use Spare CFPA with damaged traces. NAS 5-24200 CLASSIFICATION OF DEFECT TI. CONFIGURATION ITEM NOMENCLATURE 12. CD RO. Radiometer MIROD MAJOR II CRITICAL 15. HOLE OF PART OF LOWEST ASSURED MISCORD 19. RECURRING DEVIATION VALVER 17. LOT NO. YES PWB Distribution 50968 21. EFFECT ON DELIVERY SCHEDUR E 4 weeks if not approved 23. DESCRIPTION OF DEVIATION WAIVER Copper traces on distribution PWB were damaged during a trimming operation. The traces are not cut thru and examination of a like defect on a spare board shows that adequate trace remains. Damage is per NCMR 392551. More than half of trace remains intact. 24. KEED FOR DEVIATION/WAIVER To rework this board would require removal and reinstallation of 100 wire bonds. The rework to the board itself would need to be developed and if unsuccessful would result in a new procurement that would take an additional 6 to 8 weeks. There is also some risk in removing and reinstalling the wirebonds. SYS ENGR 004 YTYLZ APPROVAL/DISAPPROVAL APPROVED. APPROVAL RECOMMENDED DISAPPROVED C. GOVERNMENT ACTIVITY

NASA

DD . 22. 1694

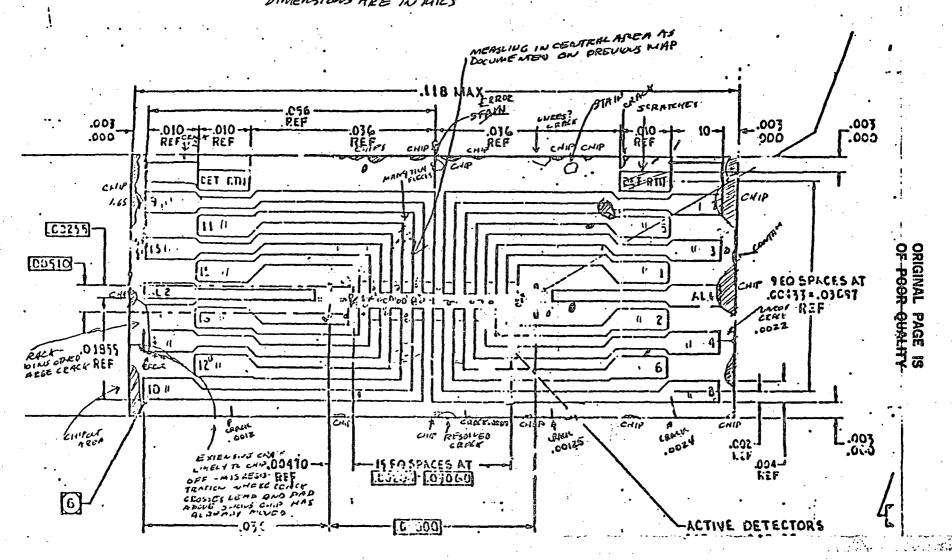
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RECUIST FOR D				DATE PREP	ARED		PROCUPING A	:11VITY	<b>40.</b> .	
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QUEST FOR	DEVIATION/WA	IVER		DATE PREP	APED C		PROCURING A	CTIVITY	10. L/	
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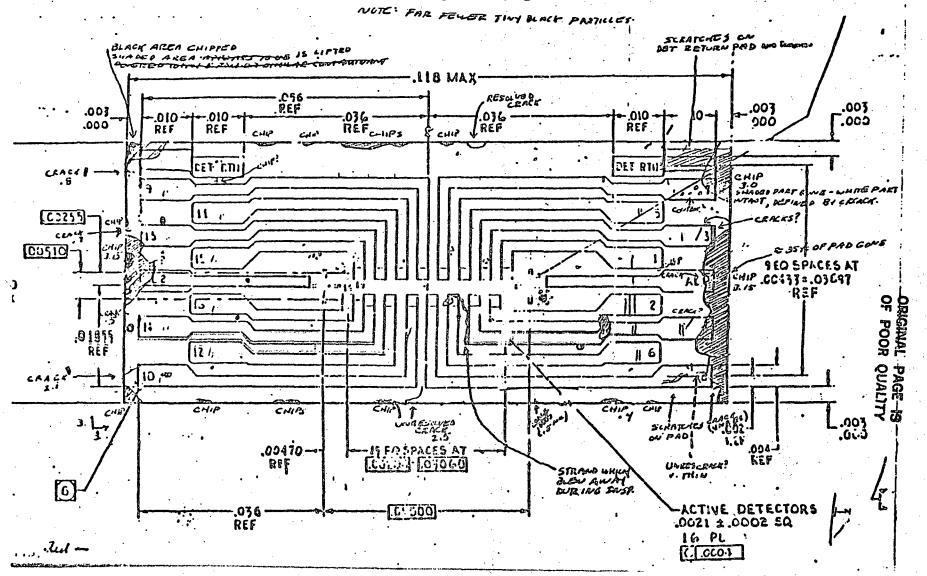


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PSIR 1/27/82

## TM LOT15 # 112

AFTER CLEANING ON MPCO DIMENSIONS IN MILS



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	. Randall				•		2. DEVIA	TION	·	X WAIVER .
	5 Coromar Di	rive. Golet	ta. C	A 93117			3. X MINOR		ROLAM	CRITICA:
	. DESIGNATION			2	S. BASE LINE	AFFECTED		6. OTH	ER SYSTE	45/ CUNF I GL.
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	al Plane As	sy.	5097	3 - B	201	1	YES			X 100
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SBRC. 75	5 Coromar Dr	ive, Gole	ta, CA	93117	٠.		3. MINOR	Y 14A.	JOR CRITICS
	. DESIGNATION		DH/WAIVE	R	15. BASE LINE	AFFECTED		. OTHER	SYSTEMS/CONFIGU-
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b- 1270 .				ļ	11323	5	0973	B 138	395A, 2870A
6. 1751 PEAN				<u> </u>					
	. I ALICH SALVER				•			1	ACT NO. B CINE II
Permiss	ion to use F	-1 CFPA w	ith dis	crepanci	es per f	R82 <b>08</b>	CLASSIFICATION		-24200
•	THE THE HOUSELL	ATURE			12. CP NO.	13. 02FEC1 1	O. IA. DEFECT	CLASSIFIC.	ATION
Radior	neter	•			11		X M11408	. []w	JOR CRITICA
15. SACE (# PAE	CO LOSTIT ASSEMPLY	MFECTED	1	OR TYPE DESIG.	17. LOT NO.	10. CTY	19. RECURRI	MG DEVIAT	I ON WAI VER
CFPA			5097	73	201	1	YES		NO
: 2. (((C) C)					21. EFFECT O				<del></del>
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27. TITLET ON	INTERPATED LOGIS	TIC SUPPORT.	INIEHPALE.	tic.					
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Permi	ssion to use y of FR 8208	F-1 CFPA		iiscrepar	ncies per	FR &20	8		
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4. HEED FOR DEVIATION WAIVER

To determine selects that would improve the pulse response would require removal of the optical filter assembly and retest. This is a risky operation and there is no guaranty that the results of reselection would give im specification performance. Discrepancies are small and will not affect performance enough to warrant rework.

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REA Mandall SYS ENGR	UEngi P	QR DO 2114, PE Gurief Manuary
25. PRODUCTION SYFECTIVITY BY SERIAL NUMBER 003		
28. SUMILITING ACTIVITY OF AUTHORIZING LIGHTURE  FRO HULLIAN	Program History	9er.
27. APPR	OVAL/OISAPPROVAL	
APPRIVAL RECOMENDED	APPROVED	DISAPPROVED
LANDSAT-D PROJECT OFFICE	Sissil Open	Jei 2/18/82
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# ORIGINAL PAGE IS OF POOR QUALITY SPACE AND COMMUNICATIONS GROUP EALLURE REPORT

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# ORIGINAL PAGE-IS OF POOR QUALITY SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

#### HUGHES

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AIRCRAFT COMPANY FR SERIAL NO.
• LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON ADDITION CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON
IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.
BAND S HAS THE FOLLOWING OUT OF SPEC, CONDITIONS:
PER 16192 PARAGRAPH 4.14
TRANSIENT RESPONSE SPEC: = 10% OVERSHOOT
CH. 4 15 10.4% CH. 10 15 10.5%
CH. 6 15 10.8% CH. 11 15 11.2%
CH. 7 15 11.0% CH. 12 15 10.8%
CH. 9 15 11,5%
SETTLING TIME SPEC: SETTLED TO WITHIN 15% A
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SETTLED TO WITHIN 1.0% A
E 290 + 60 M SeE
Aft
CH-10 15 + 2% AFTER 38 USec
T 1.5% AFTER 48 MSRC
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3 dB POINTS : SPEC: - 2 TO - 3 dB AT 52 KHZ
3 dB POINTS : SPEC: - 2 TO - 3 dB AT 52 KHZ
011 10 10 -7 10 10 - 10 17 111 -
CH. 10 15 3.19 dB AT 52KHZ
CH, 12 15 - 1.95 dB AT 52KHZ
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DELAY TIMES SPEC! DELAY TIMES SHALL BE WITHER # 0.5 USEC OF EACH OTHER
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### HUGHES

# SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

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	SETTLED TO WITHIN	1.0 %
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	CH. 5 " " 1,0 % - AFTER 35 US	ec
	3 dB POINTS SPEC! - 2 TO -3 dB AT 52	KH2
	CH. 5 15 - 3, 25' &B AT 52 KHZ	
	CH. 16 IS - 3,32 dB AT SZ KHZ	
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#### Actachment to Request for Deviation/Waiver No. W-142

- Assembly Planning (AHR) was issued for use in the fall of 1978. Investigation
  which was performed on the Protoflight Model, which had the same problem,
  was accepted, however, there appears to be no documentation to support this
  investigation.
- 2. Depositions were performed per standard procedures (hand-written) with the ARR defining the amount to be evaporated, during 1978 1980 period. However, the evaporation lab utilizes Laboratory Procedure Instruction (LPI) which are now being changed to Manufacturing Production Engineering Instructions (MPEI). MPEI's are being released through Production Engineering under W.G. Speth.
- 3. Resistance Measurements recorded on attached AHR data sheet do not meet requirements specified on drawing Note 15 which says that: "Pad to Pad resistance of traces shall not exceed 3.0 ohms." The resistance of the traces is minimal and will not have a measurable affect on the detector performance. This variation is inherent in chemical evaporation processing. See Table below for actual readings.

Measurement Point	Specification	Before Temp Cycle	After Temp Cvcle
Hg Cd te 5-3(-)	<3 ohms	1.8	1.7
5-3(+)	.,	3.4 (OT)	2.7
5-4 -	. 19	4.3 (UT)	3.7 (OT)
5-4(+)	60	5.1 (OT)	4.7 (OT)
5-2(-)	10	5.0 (OT)	5.0 (OT)
5-2(+)	ie ie	4.5 (OT)	3.3 (OT)
5-1(-)	10	3.4 (OT)	2.7
5-1(+)	10	1.8	1.7
T, Top (-)		2.8	2.7

OT - Out of Tolerance

4. Deposition thickness was not recorded at operation 3150. In reviewing previous history the run number 19.4 which was the same for the Protoflight substrate used indicates that the lab log book for Run number 1984 recorded a thickness of 2000 angstroms on October 8, 1978.

EQUEST FOR DEV		(9W\1771)RT2					ł		IVITY A		/
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4. DESIGNATION FOR	DEVIATION/WA	IVER	S. DASE LINE	AFFECTED			6. 01	HER SYST	EMS/CONF	cu.
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#### Program Instruction 010

ORIGINAL PAGE IS

Minor - System Engineering Major/Critical - Program Manager

DISAPPROVED

DATE

OF POOR QUALITY DATE PREPARED PROCURING ACTIVITY NO. REQUEST FOR DEVIATION/WALVER (SER WIL-STD-480 OR 481 FOR INSTRUCTIONS) 6-28-82 1. ORIGINATOR NAME AND ADDRESS R. Wengler X VALVER DEVIATION Santa Barbara Research Center NOLAM MISSO CRITICAL 75 Coronar Drive, Goleta, CA 93117 6. OTHER SYSTEMS/CONFIGU-RATION LIENS AFFECTED S. BASE LINE AFFECTED 4. DESIGNATION FOR DEVIATION/WAIVER A. HER. CODE c. SYS. DESIG. . MODEL/TYPE X TIONAL X ISO 725 11323 W-162 F-1 SPECIFICATIONS AFFECTED-TEST PLAN 8. ORAWINGS AFFECTED SPEC./00C. NO. 501 MFR. CODE MESER MFR. CODE REV. NOR. NO. 11323 51065 H EOS 4257A. e. SYSTEM GSFC 400.8-D-210 6. ITD4 c. TEST PLAN O. CONTRACT NO. & LINE ITEM NASS-24200 Band 5 to Band 7 Misregistration TI. CONFIGURATION ITEM HOMENCLATURE 12. CD NO. 13. DEFECT 40 14. DEFECT CLASSIFICATION Radiometer MAJOR MAJOR IS. NAME OF PART OR LOWEST ASSOCIATE AFFECTED 19. RECURRING DEVIATION/ TAIVER 18. GTY 50973-B **CFPA** 1 YES X KO 21. EFFECT ON DELIVERY SCHEDULE 20. EFFECT ON COST/PRICE >>\$1,000,000 l year 22. EFFECT ON INTEGRATED LOGISTIC SUPPORT, INTERFACE, ETC. Misalignment must be corrected for in data processing. 23. DESCRIPTION OF XCHOLEGY WAIVER Section 3.2.4 of specification GSFC 400.8-D-210 requires that bands 5 and 7 shall be registered within 0.2 pixel. Failure report F5777 states that is the F-1 system bands 5 and 7 are 26.25 IFOV's apart or registration is within 0.25 IFOV However HS236-8026A states that the displacement from nominal position in the along scar direction is -0.132 IFOV for band 7 and +0.099 IFOV for band 5. Thus, the total misregis tration is 0.231 IFOV. (HS236-8026A attached) To proceed with the F-1 system having the band 5 to band 7 registration exceeding the allowable tolerance by 0.031 IFOV. To correct the discrepancy would require rework of the Cooled Focal Plane. SYS ENGR PE S/N 003 only TY MITHORIZING SIGNATURE

27. APPROVAL/DISAPPROVAL

SIGN TURE

APPROVED ..

DD . 22. 1694

. GOVERNMENT ACTIVITY

APPROVAL RECOMMENDED

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SBRC, 75	Coromar Dr.	, Goleta, CA 🧐	93117			, X MIHOS	X100000	JOR CRITICAL
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## REQUEST FOR DEVIATION/WAIVER

## ORIGINAL PAGE IS OF POOR QUALITY ACTIVITY NO.

SBRC. 75 Coromar Dr., Goleta, CA 93117    Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Dr. Soleta, CA 93117   Continuation for Management for Ma	SBRC, 75 Coroman Or., Goleta, CA 93117    A. DESIGNATION FOR DEVIATION/WAINER   Spare   1. DES. CORE   A. PETA OCSIG.   A. SELVENTER DISTRICT   A. DESIGNATION FOR DEVIATION/WAINER   Spare   1. DES. CORE   A. PETA OCSIG.   A. SELVENTER DISTRICT   A. DESIGNATION OF THE DESIGNATION	(SEE MIL-STD-	480 OR 481 FOR 1	Mainucitumaj		6-30	o-82·		<b>,</b>		•		
A. DESIGNATION FOR DEVIATIONALISM Sparry 11223 Sparry 112	4. DESIGNATION FOR DEVIATION/WAIVER  5. DASK LINE AFFECTOR  5. SPECIFICATIONS AFFECTED. TEST PLAN  1. SPECIFICATIONS AFFECTED. TEST PLAN  2. SPECIFICATIONS AFFECTED. TEST PLAN  3. DASK LINE AFFECTED  1. SPECIFICATIONS AFFECTED. TEST PLAN  3. TITCH  3. TITCH  4. TITCH  5. TITCH  5. TITCH  6. DOWN MOSE AFFECTED  6. DOWN MOSE AFFECTED  6. DOWN MOSE AFFECTED  6. DOWN MOSE AFFECTED  7. TITCH OF DEVIATION/WAIVER  7. TITCH OF DEVIATION/WAIVER  8. TITCH OF DEVIATION/WAIVER  TITCH OF DEVIATION/WAIVER  RADIOMETER  7. TITCH OF DEVIATION/WAIVER  8. DOWN MOSE AFFECTED  11. CONTINUE TO DEVIATION/WAIVER  12. THE OF THE WOOD AFFECTED AFFECTED  13. THE OF THE WOOD AFFECTED AFFECTED AFFECTED  14. THE OF THE WOOD AFFECTED A								2. Devi	TION	w.c.	V	WAIV
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Spare 11323   1. SPTS. 06516;   1. SETTS. 06516;	** SPACE   11232   11233   112		A. DESIGNATION	FOR DEVIATI	ON/WALVE!		S. BASE LINE	AFFECTED			HER SYST	ENS C	ONF I
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### HUGHES

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## SPACE AND COMMUNICATION GROUP FAILURE REPORT

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#### TECHNICAL INTERNAL CORRESPONDENCE

To: D.M. Randall 21-23

suggect: Failure Investigation of InSb.
Photovoltaic Detector

DATE: 07 July 1981 REP: 7611.40/1

FROM: F. Reizman 76-11-44

BLDG. 6 MAIL STA. C136 EXT. 6343

#### ABSTRACT:

WAY BUYER CONTRACTOR CONTRACTOR

Failure analysis was performed on a photovoltaic InSb infrared detector, which was suspected to have been damaged by electrostatic discharges. Three diode channels (out of sixteen) were electrically degraded, without visible signs of damage.

Surface metallization was removed by RF sputtering in argon. No distinguishing features were visible on the damaged diodes until sputtering had proceeded below the metal/oxide interface. Two of the three degraded diodes then showed distinguishing features, whose form and location very strongly suggest that they are sites of electrostatic damage which caused the diodes to fail.

A discussion of the analysis methods, including sputter-etching, is given in an appendix.

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#### INTRODUCTION

Several photovoltaic InSb detector chips were submitted to TSD for failure analysis. Several diodes (channels) out of sixteen in each chip had been shorted or degraded, without any visible change in their microscopic appearance. (Figure 1 shows the overall layout of the chip.) SBRC strongly suspected that the degraded performance of these diodes was due to electrostatic damage (ESD). [Ref: SBRC Internal Memo HS236-7391, dated 12 March 1981.]

Since electrical measurements of the diode characteristics could be made only at 90°K or below, TSD confined its failure analysis to optical and electron-beam microscopy.

In an attempt to locate the damage more precisely, an ultrasonic cutting probe with tungsten-carbide point was used to cut conductor traces near the diode region. After cutting the trace, the bonding pad tested "open" with respect to the substrate, both on degraded and good channels. This shows that there was no shorting through the thick oxide, but that the electrical damage was at or near the junction.

Metal and oxide coatings were stripped in an effort to find evidence relating to the cause of failure. In the following pages we describe the investigation and the resuls which strongly suggest ESD as the cause.

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#### II. DEVICE AND COATING STRUCTURE

The device substrate is indium antimonide (InSb), which is coated in succession with: 1) a thin proprietary passivation layer

- 2) a thin evaporated SiO (inner rectangle)
- 3) A thicker SiO (outer area). On this thick oxide most of the conductor traces and wire-bonding pads are coated.
- 4) Thin metallization: titanium (several hundred Å) for adherence, followed by about 3000 Å of gold.
- 5) Thick metallization: consists of the thin Ti/Au above, covered by another Ti/Au double layer about twice as thick, giving a total thickness of about 1 µm. Thick metallization is confined to the area near the diode and is used to span the sheer step from thick to thin oxide.

Each diode is formed by a mesa in the central area. The mesa is oxide-covered, except for a contact window that gives access to the metallization. A rough appearmace in the center of this contact window marks the thin palladium coating which improves electrical contact with the Ti/Au conductor trace. A cross-section of the chip taken through a typical diode is shown in Figure 2. This diagram is obtained mostly by interference microscopy supplemented by ordinary optical microscopy and information from SBRC. Further discussion is reserved to Appendix A.

The appearance of the of the devices as received is shown in Figures 3, 4, and 5. Figure 5, taken on the Band 5 chip, shows metal films with "frills" or "pie-crust" edges. These are formed as a result of the photoresist liftoff process that defines the metal patterns. Figures 4 and 5 also show the difficulty of getting good metal coverage over the sheer oxide step.

F2387

#### III. STRIPPING OF COATINGS

Optical examination, both at SBRC and TSD, showed that no visible signs of electrical damage were present. It was therefore thought recessary to remove the metallization, and possibly part of the oxide, to expose the site of the damage and have a reasonable likelihood of making it visible.

Chemical etching was at first tried, using potassium iodide to remove gold, and a preparation containing HF for the titanium. Further details are given in Appendix 8. This approach failed because of formation of a bulky corrosion product on contact with InSb. As a result, no useful information was obtained from the Band 5 chip.

To avoid these difficulties, RF sputter etching was then tried. This technique subjects the sample to an RF glow discharge in argon, which removes material by ion bombardment without chemical reactions. By this relatively clean method, matallization was removed and ESD sites located. Further details about sputter-etching are given in Appendix C.

#### IV. RESULTS

Figures 3, 4, and 5 are representative of the diodes as they appear in the as-received condition. Careful optical examination at SBRC and TSD, and SEM examination at TSD, failed to show any systematic differences between diodes 7, 9, 12 (degraded) and the nine remaining (undamaged) diodes.

Sputter-etching was then carried out for a total of 190 minutes in several stages. After 190 minutes the optical views (Figures 6, 8) show a small amount of titanium remaining of the thick metallization. Figures 7 and 9 show roughly the same areas in SEM view. The small amount of titanium is thin enough to be penetrated by the electron beam, so that Figures 7 and 9 are basically pictures of the oxide. Nevertheless, no characteristic: trace of ESD can be seen at this point. Although some oxide has been sputtered away in the unmetalized areas, the covering of titanium still preserves the oxide in the diode areas originally coated with thick metallization.

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After an additional two hours of sputter-etching, however, diodes 9 and 12 have developed "new" features which do not appear in any of the others. Diode 12 now shows a notch in one edge of the mesa (Fig. 10, 11, 12), while diode 9 shows linear markings (furrows) at two mesa corners (Fig. 13, 14, 15, 16). Figure 16 should be compared to a picture of known ESD phulished by A. Trigonis (Fig. 17).

The association of these features with ESD is supported by the following arguments:

- 1. The features are seen near the edge and corners of the mesa, where the junction reaches the surface and electric fields are strongest. Junction curvature and discontinuities in dielectric constant combine here to raise the field strength above its average value, and create local breakdown.
- 2. Since the surface is covered with SiO and metal, all breakdown takes place in the oxide under the electrodes. Unless enough energy is liberated to disturb the outer surface, the damage will not be visible until the metal is removed and oxide etching reaches the damaged region. Then a difference in etch rate may create an "etch pit", analogous to preferential effects in wet-chemical etching. The belated appearance of these features is therefore suggestive of a low-energy ESD.
- 3. No such features appeared at the same time on undamaged channels. It must be admitted that channel 7 does not show such features, so that the correspondence is not bidirectional. However, the subtle nature of ESD makes it plausible that channel 7 has damage too slight for the preferential etch to reveal, but nevertheless electrically important.

#### CONCLUSIONS

 The anomalies at the edge of the mesa in channels 9 and 12 are probably associated with ESD, and to this extent the hypothesis of ESD on the failed detectors is confirmed.

Proceedings, 1976 Reliability and Maintainability Symposium, p. 165

F 2387

- 2. Sputter-etching in argon is a practical method of removing metallization from InSb devices. As used in the Thin Film Lab at TSD, however, the slow etch rate for titanium is a disadvantage. Better vacuum technique could improve this, however, and make etch rates for active metals closer to those for noble ones.
- 3. When using sputter-etching as a means for stripping coatings, it is important in interpretation to allow for changes of surface feature form and topography. These include the following:
  - (a) preferential attack at vertical surfaces
  - (b) formation of a groove at a mesa foot
  - (c) appearance of a raised relief image of a metal trace after the metal is etched away. This relief is left because oxide was etched in the bare areas, but was masked by the metal. Chemical etching, in contrast, usually removes metals without appreciably etching the oxide. In consequence, after metal is sputter-etched off, the oxide topography is more complex than it was before the metal was applied.
  - (d) V-grooving of fine cracks.

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APPENDIX A:

Interferograms

The height of surface features and thickness of thin films can often be measured under the microscope by optical interferometry. This method has several advantages over profilometers (e.g., Dektak, Talysurf):

- Thicknesses or heights are obtained in terms of a wavelength of light, whose value is fixed by nature. There is no need to calibrate.
- 2. Data is automatically obtained over a two-dimensional area, rather than along a linear track. A photograph can serve as a compact record of a great many local heights.
- It is often possible to find the thickness of a transparent film if the index of refraction is known, even if there is no hole or step.

In Figure 2, an index of 1.9 was assumed for SiO, and used for thickness in the central region. For the thick oxide areas, it was possible to check this value using several chipped areas near the edge where the InSb substrate was exposed. There was good agreement with measurements of the step height.

The measurements in this work were made using a Watson Interference Objective adapted to a Reichert microscope. Other companies make instruments very convenient for shop use in evaluating surface finishes or scratch depths. Figure 18 shows a typical micro-interferogram used in making measurements for Figure 2. The fringes are at intervals of .29 µm (a half-wave of yellow light).

Somewhat related to interferometry is the Nomarski objective. While Figure 18 quantitatively shows heights, Nomarski contrast indicates slopes. Thus it is good for showing the vertical dimension in a qualitative way, making surface contour easy to visualize. Most of the optical micrographs in this report were made with Nomarski contrast.

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APPENDIX B:

Chemical Etching

Following the usual practice for silicon IC's, attempts were made to strip metallization with chemical etchants. Figure 19 shows a typical diode after removal of the external gold layers with a potassium-iodide solution. Small amounts of gold remain in several areas, while the oxide is completely untouched. The intermediate titanium protects the inner gold layer in the thick-metallization area. The inner gold could not be removed until an application of "Sapp etch" penetrated the titanium.

Unfortunately, the second application of KI etch came into contact with bare InSb in the now-open contact window. A purple-black, bulky corrosion product was formed which obscured detail near the edge of the window, an area in which ESD effects could be expected. After an unsuccessful trial on the Band 5 detector, the chemical stripping approach was abandoned.

Gold Etch

"SAPP Etch" for Ti

Water 250 ml KI 25 g

HF 1-3 m1 HNO<sub>2</sub> 2-6 m1

I 19.1 g

water to make 100 ml

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APPENDIX C:

Sputter-Etching

Sputter-etching was done by RF sputtering in the Thin Film Laboratory, by D. E. Blackmon, through the cooperation of J. F. Linder.

The sputtering action is completely physical, by argon ion bombardment, so that no corrosion products are formed. The erosion or "etch" rate tends to be faster for noble metals like gold than for active metals, unless the partial pressure of oxygen in the system is very low. In a "dirty" system, active metals tend to sputter almost as slowly as oxides.

There was in fact a large difference in the sputtering rates of the gold and titanium layers. The vacuum before admission of argon was said to be about  $6 \times 10^{-6}$  Torr, and the argon pressure  $5 \times 10^{-3}$  Torr. RF voltage was 700v and power about 200 watts. We noticed considerable differences in time needed to sputter away metallization on the actual and practice samples. These differences might have been due to accidental air leaks or differences in heat sinking.

As sputtering proceeds, certain changes occur in surface topography which are different from those seen in chemical etching.

- 1. Vertical surfaces are eroded faster than horizontal ones, due to an angle-of-incidence effect. Ion bombardment is actually more effective at removing material if it is oblique rather than perpendicular. This results in mesa edges moving back but remaining steep. A groove was seen to appear at the foot of the mesa after prolonged sputtering, perhaps due to argon ions reflected obliquely from the mesa slope (Figures 7, 11, 12, 14).
- 2. A wire close to the surface of the sample can be seen to cast a sharp vertical "shadow" (Figure 20).
- 3. Fine cracks, originally only about 0.3 µm wide, were "gouged" out in V-groove form after prolonged sputtering (see Figure 21). Cermin conical pits, of perfect geometrical form, may have similar origin by enlargement of a fine pinhole (Figure 22).

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Figures 20 and 21 show where a crack has been emphasized by sputtering, except where it crosses the "shadow" of a lead wire. This crack was produced accidentally by TSD while mounting the chip in silver-epoxy, and extends completely through the chip.

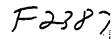
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Component Reliability Section

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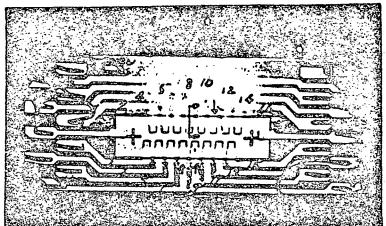


FIGURE NO. 1. - Band 7, chip layout and numbering system. This thin-oxide region, containing the diodes, is in the inner rectangle. The section line marks the typical cross-section of Figure 2. The actual size of the central rectangle is about .375 x 1.36 mm.

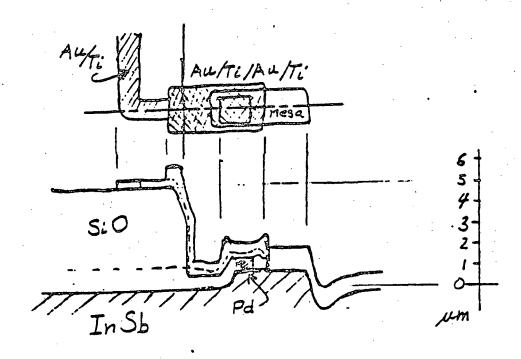


FIGURE NO. 2. - IR Detectors - Compting structure from interferometry.

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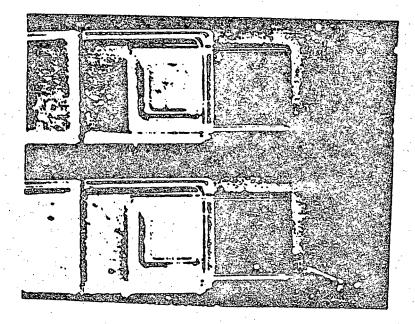


FIGURE NO. 3 Channels 10 and 12, as received, Nomarski contrast.

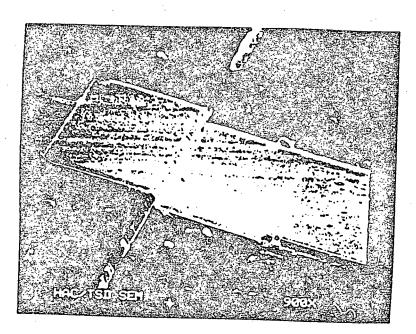
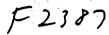
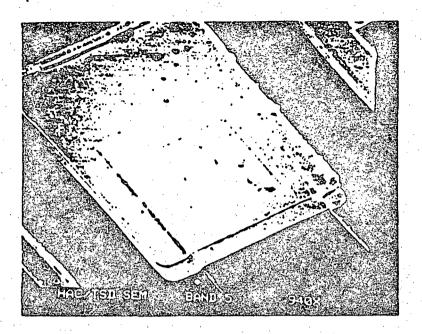


FIGURE NO. 4
SEM of typical diode as received showing coverage at step and thickened metallization

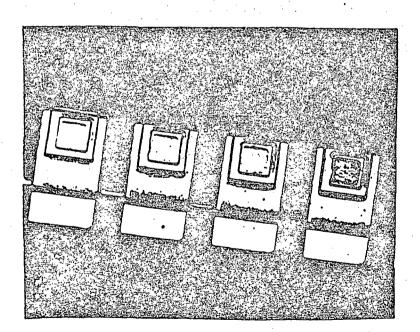




#### FIGURE NO. 5

Typical diode, Band 5, as received. Clearly shows double metallization, frills at metal edge, possible continuity problem at oxide step.

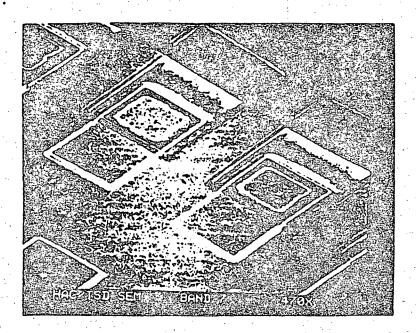
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#### FIGURE NO. 6

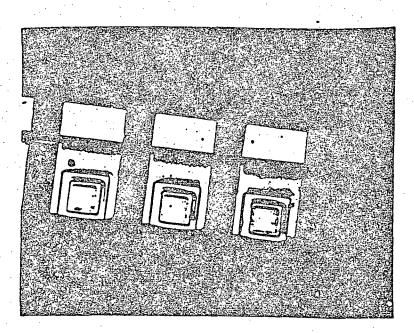
(190 minutes sputter etch)
Optical micrograph showing channels 5, 7, 9, 11 (from left). Seven and nine are electrically damaged. Note remaining Ti metal in area of diode; conductor traces are now marked by raised area.

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#### FIGURE NO. 7

(190 minutes sputter etch)
Nearly same area as Figure
6. SEM view showing
channel 7 and 9 in center.
Oblique view shows groove
around mesa. A small
amount of residual gold
(inner layer) appears at
foot of oxide step.



#### FIGURE NO. 8

(190 minutes sputter etch)
optical view showing channel
12 (damaged), 14, 16 from
left. Residual gold shows
dark in optical, light in
SEM views.

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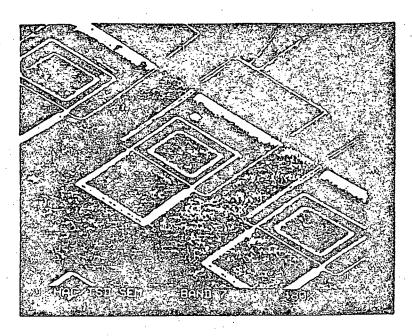


FIGURE NO. 9

SEM showing nearly sama area as Figure &, channel 12 in center. The spot (arrow) on channel 12 is a small area of residual metal probably due to shielding by a dust particle during sputtering.

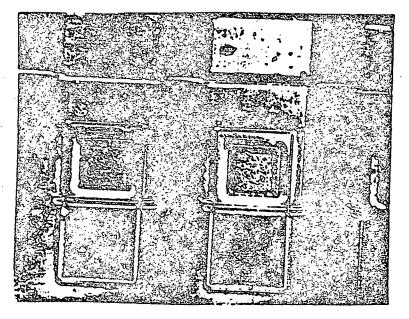


FIGURE NO. 10
310 minute sputter etch, channel 12 (left) and channel 14, optical with Nomarski contrast. A notch has appeared in the left side of the mesa of channel 12.

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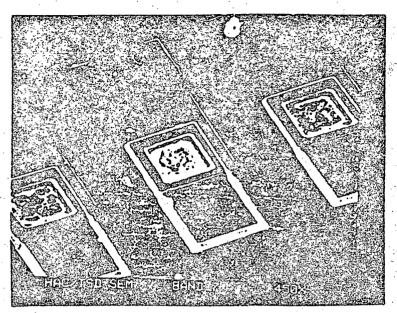


FIGURE NO. 11

Same area as Figure 10,
SEM. Channel 12 in
center. The notch is
clearly shown; note also
a deeper groove around
the mesa than that visible
after 190 minutes.

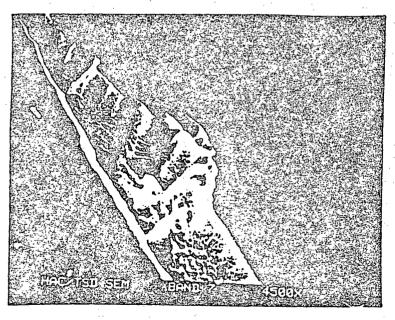


FIGURE NO. 12 Shows the notch under higher magnification.

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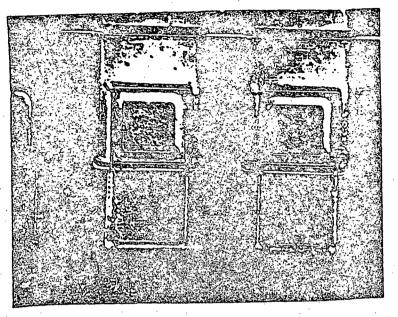


FIGURE NO. 13
Optical, channels 11, 9, 7 (from left). Note damage on channel 9, at laft edge and upper left corner of mesa. Nomarski contrast.

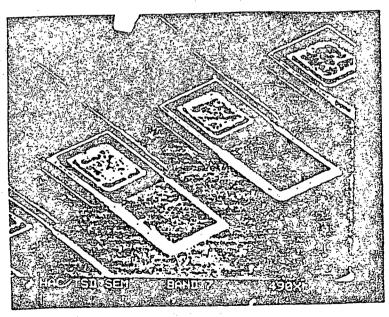


FIGURE NO. 14
SEM showing channel 9 and 7 in center. Same features are seen plus grooving around mesa.

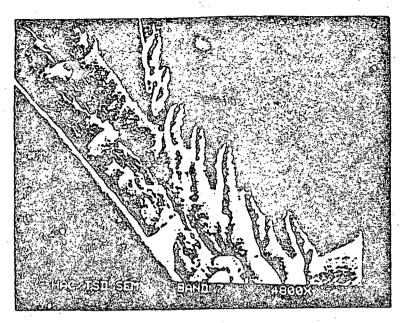


FIGURE NO. 15
SEM showing damage at left edge of mesa on channel 9 (compare Figure 14).

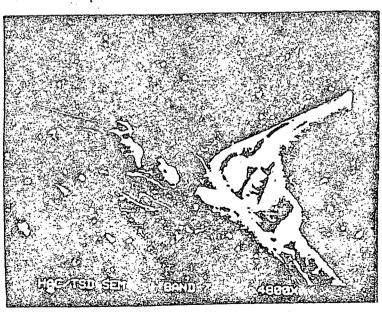


FIGURE NO. 16
SEM showing damage at upper left corner of mesa, channel 9 (Figure 14).

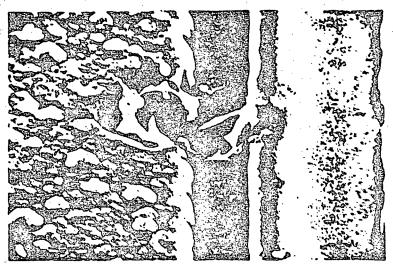
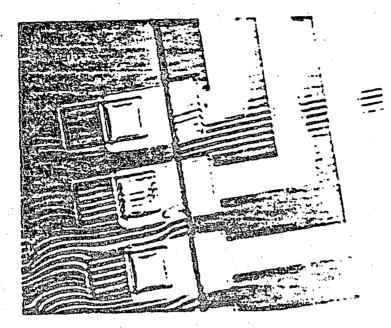


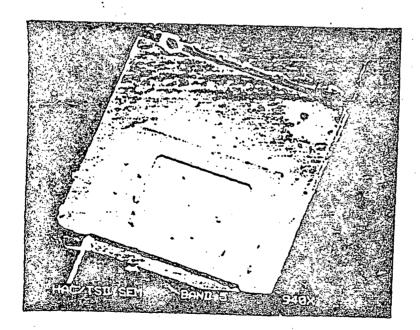
FIGURE NO. 17
Photo reprinted from Trigonis, Ref. 1, as an example of ESD.
Compare to Figure 16.
(Original, 4300X)

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#### FIGURE NO. 18

A white-light interferogram on the as-received Band 7 chip. In the thin oxide at left, two fringe systems can be seen, from the oxide surface and one from the oxide/substrate interface.



#### FAGURE NO. 19

SEM of typical diode after 45 seconds KI etch. Lighter granular material is residual gold. Remaining exposed metal is Ti; thicker area is Ti/Au/Ti sandwich.

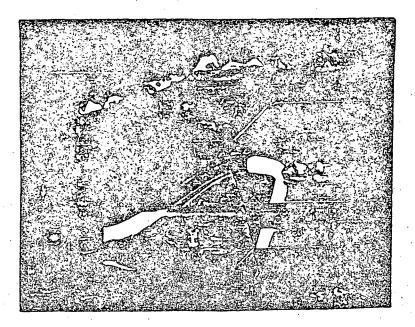


FIGURE NO. 20

Relief shadows of a lead wire, after several stages of sputter-etching. The wire was accidentally moved between stages. Some Ti remains in the last shadow. A crack appears, crossing the shadow. (Optical, Nomarski contrast.)

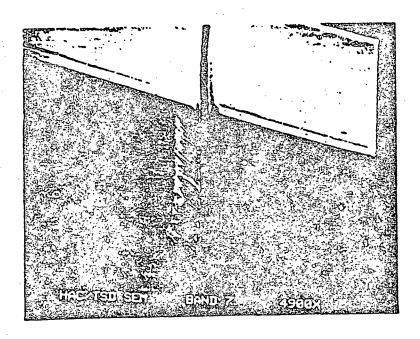


FIGURE NO. 21

SEM of crack seen in Figure 3 showing V-groove enlargement in sputtered area.

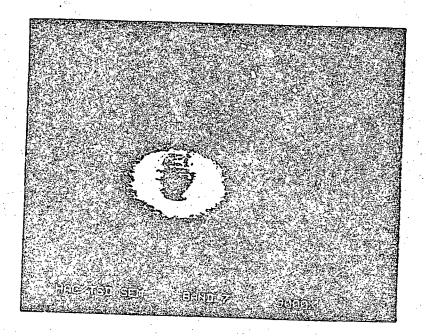


FIGURE NO. 22 Conical pit on masa top after 310 minutes sputtering.

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## SPACE AND COMMUNICATION GROUP FAILURE REPORT

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### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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HUGHES AIRCRAFT COMPANY

#### SPACE AND COMMUNICATION GROUP FAILURE REPORT

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## SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

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## # MAIN TOST

SPACE AND COMMUNICATIONS GROUP

PA	CE AND COMMUNICATIONS GROUP EL SEGUNDO, CALIFORNIA	FAI	LURE	REPOR'	r	3	8203
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	& HARDWARE LEVEL SPACECRAFT WHEN FAILURE WAS OBSERVED SYSTEM	SUBSYSTEM UNIT		SSEMBLY	MODULE	CARD PART	
	EQUIPMENT IDENTIFICATION:	NAME		PART NUMBE	S/N	MAM	JFACTURER .
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## SPACE AND COMMUNICATIONS GROUP

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### HUGHES

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#### SPACE AND COMMUNICATIONS GROUP

**FAILURE REPORT** CONTINUATION SHEET 5 8207

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#### SPACE AND COMMUNICATION GROUP **EQUIPMENT CHECKOUT** FAILURE REPORT

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CONTINUATION SHEET

S 8208 CONT. SHE FR SERIAL NO.

TCRAFT COMPANY ADDITIONAL FI CONTINUATION SHEET(S) USED \*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON - IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY, OUT OF SPEC CONDITIONS: FOLLOWING THE 16192 PARAGRAPH 4.14 10% SENT RESPONSE ENT SPEC: OVERSHOOT :0.4% CH. 13 10:5 % 10 IS 10.8% 11,2% 15 CH. 6 CH. 11 IS 11.0% 10.8% 7 15 CH. 12 IS CH. Ç 15 11.5% CH 1,5% AFTE SETTLING TIME SPEC: SETTLED TO WITHIN 2290 30 USec 1.0% MITHIN Settled TO C 2 % + 60 M SOE + 2% CH-10 15 AFTER 11. Sec + 1.570 48 12 SR C AFTER 0% after ے جو رہ POINTS . SPEC! 3 3 dB dB 52 KH2 TO 47 3.19 dB CH. 10 IS 52 KHZ AT 95 ol B CH. 12 13 52 KHZ SPEC: TIMES DELAY DELAY TIMES SHALL BE WITHIN OF EACH OTHER  $A_{LL}$ POPULATION CHANNELS AS NOT MEET THIS REQUIREMENT. RISETIME usec) (in 12Sec) FALL TIME IN 12.7 12,2 9 13.1 9 12.0 12.0 2 12,5 10 13.8 13,0 10 12,4 13,0 12.5 3 16 12.0 3 11 12.0 12.2 12.6 12 128 12 4 11,6 120 12.2 13 12.5 5 13 12.6 14 12.4 6 13.1 14 13.0 6 124 11.9 11.6 15 12.1 7 15

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## HUGHES

# SPACE AND COMMUNICATION GATUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

S 8208 CONT. SHEET

í	IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.		CONTINUATION SHEET(S) USG
Į	BAND 7 HAS THE FOLLOWING OUT OF SPEC, COM	1 to T1	043.
٦	PER 16192 PARAGRAPH 4.14		<u> </u>
	TRANSIENT RESPONSE : SPEC: 6 10 20 OVE "-H	OOT	
	CH, 6 15 11.0 %		
	SETTLING TIMES SPEC: SETTLED TO WITH	1101	1.5%
	AFTER C':0+3		
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	AFTER 6290 + 6	GUS	<u> </u>
	CH. S IS SETTLED TO 1.5 90 AFTER 33	usa	ے
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	3 GB POINTS SPEC: - Z TO -3 &B AT	52 k	クルチ
	CH. 5 IS - 3.25 OB AT 52 KHR		
	CH, 16 15 - 3.32 dB AT 52 KHZ		
	DELAY TIMES SPEC. DELAY TIMES SHALL	BE	
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#### SPACE AND COMMUNICATIONS GROUP EAUTIDE DEPORT

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#### Hughes

SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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HUGHES AIRCRAFT COMPANY
PACE AND COMMUNICATIONS GROUP
EL SEGUNDO, CALIFORNIA

FAILURE REP

Γ	1. PROGR.'M NAME A		2 GU	4	1 MODEL		BSERVED	S. DATE OBSERVED	
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ł	WHEN FAILURE WAS OBSERVED	SPACECRAFT	SUBSYSTEM		SSEMBLY UBAGSEM <b>B</b> LY	MODULE MICAM	ı	☐ CARD ☐ PART	
1	EQUIPMENT IDENTIFICA	TION:	NAME		PART NUME	ER	S/N		FACTURER
	7. SUBSYSTEM	<del></del>				·····		با الناب الموف	
1	8. UNIT								
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### SPACE AND COMMUNICATIONS GROUP

NUMBES AIRCRAFT COMPANY SPACE AND COMMUNICATIONS GROUP EL SEGUNDO, CALIFORNIA FAILURE REPORT

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П	1. PROGRAM HAME AND HUMBER	TM	2 GLA	FLIGHT	4. TIME OBSERVED	A DATE OSSERVED	# YR ##
	MARDWARE LEVEL SPACE	CRAFT SUB		ASSEMBLY (	MOOULE MICAM	CARD PART	
	EQUIPMENT IDENTIFICATION:		NAME	PART NUMBER		MARUFAC	TURER
	7. SUBBYSTEM					<del> </del>	
	& utal	**************************************					
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## SPACE AND COMMUNICATIONS GROUP EAUTIEF REPORT

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## SPACE AND COMMUNICATIONS GROUP

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## HUGHES

## SPACE AND COMMUNICATIONS GROUP

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	S. MASSEMELY SUBASSEMBLY		50973	201	SBIZC
	10. O MODULE O MICAM O CARD	·			
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L	PAILURE WAS DEVELOPMENT OBSERVED IN-PROCESS	QUALIFICATION     ACCEPTANCE	☐ INTEGRATION ☐ SYSTEM	LAUKCH OPERATIONS	· · · · · · · · · · · · · · · · · · ·
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[2	28. UST ALL PARTS REPLACED PART NUMBER CKT SYM	PART LOT NUMBER DAT	CODE MANUFACTURER	PROBAGLE	DEFECT ANALYSIS
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3	Z. DOCUMENT IMPLEMENTING EO	4173 42	EFFECTIVITY S	JOUZ ONLY	7//0 3/11
3	M. BASIC CAUSE OF VERIFIED FAILURE  DESIGN OF VERIFIED OFFECTIVE PARTS	TEST EQUIPMENT	MPG. PROCEDURE ASSY/FAB ERROR WORKMANSHIP	WIRING ERROR	UNKNOWN DEFECT COL
-	FAILURE DEFECTIVE PARTS  PRIMARY	☐ TEST SET-UP	36 FAILURE	© WEAR-OUT	ZRAINOR
3	TYPY) ( THOUSED	NO FAILURE		CROLAM []	SAFETY

#### HUGHES

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## SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

8438

	EL DEGUNDO, CALIFORNIA			
Γ	1. PROGRAM NAME AND NUMBER TH YOU PL 1162	1 - 1 -	30 AM, MO 6	VED DA Z4 YR &/
1	6. HARDWARE LEVEL   SPACECRAFT SUBSYSTEM	ASSEMBLY MODE	LE CARD	
	EQUIPMENT IDENTIFICATION: NAME	PART NUMBER	<del></del>	NUPACTURER
1	) SUDSYSTEM			
	8. UNIT			<del></del>
	A MASSEMBLY O SUBASSEMELY COLD FPA ASSY	50973	201 56	RC.
2	10. C MODULE C MICAM C CARD			
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ORIGINATOR		NTEGRATION CLAUNO	H OPERATIONS	· · · · · · · · · · · · · · · · · · ·
	13. ENVIRONMENT AMDIENT RADIATION	EMP 1/2 S · K II THERM	AL VAC HRS AT OTHER	
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3	27. REWORK BY ORG CATE 25.	RETESTED BY	ORG	CONTINUATION SHEET USED
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N.	22 DOC MENT IMPLEMENTING CORRECTIVE ACTION			0 1 0
133	34. BASIC CAUSE   C DESIGN C TEST EQUIPMENT C N	IFG. PROCEDURE WIRING	ERROR UNKNOWN	DEFECT CODE
ENGINEERING/RELIABILITY	OF VERIFIED   L'ENVIRONMENTAL L'EST PROCEDURE   FAILURE   DEFECTIVE PARTS   TEST SET-UP	OPKMANSHIP THEAR		
1	30. FAILURE DE PRIMARY CUNKNOWN TYPE DE TAILURE  ON PAILURE	DA FAILURE CRIT		·
1	17. Aggregate phigheten//	CLASSFICATION AMA	EEA DAG	1 310806
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Program Instruction 010

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3 weeks minimum  37 weeks minimum  37 weeks minimum  38 weeks minimum  38 weeks minimum  39 weeks minimum  39 weeks minimum  216 Epoxy was accidentally dropped onto the Band S detector while mounting the and 7 detector and subsequent cleaning caused open traces on Channels 10 & 12. Itely approved the channels. Since it is mpossible to determine if any damage was incurred on other channels during the leaning operation that may result in open traces in the future, this waiver equation permission to use silver epoxy to ensure the continuity of all the Band 5 elector traces.  Als repair is ideal for InSb detectors since the junction impedance is high (80 m y series impedance caused by use of silver epoxy is easily tolerated. Saries imply series impedance caused by use of silver epoxy is easily tolerated. Saries imply 10k obms would not have any effect on performance and impedances using silver of 11k he less than 10, ohms. See attachment A for attachment a few attachment a few attachment as the second detector traces also unther assurance that continuity will be maintained across thick \$10x.)  **The PA has had several detector changes and the risk of losing the entire FFA by hearing would be in excess of \$300000.00 and the delivery schedule would be set ack a months.  **REAL PROPERTIES AND AND AND AND AND AND AND AND AND AND	Cold For	nl Plane	Aegy	505	73		1				<u> </u>	(B)
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216 Epoxy was accidentally dropped onto the Band 5 detector while sounting the and 7 detector and subsequent cleaning caused open traces on Channels 10 & 12. liver epoxy was successfully used to repair these channels. Since it is mpossible to determine if any damage was incurred on other channels during the leaning operation that may result in open traces in the future, this waiver equests permission to use silver epoxy to ensure the continuity of all the Band 5 attector traces.  his repair is ideal for InSb detectors since the junction impedance is high ( 80 mm y ceries impedance caused by use of silver epoxy is easily tolerated. Saries imply the service and included any effect on performance and impedances using silver end to the continuity will be applied to Band 7 detector traces also wither assurance that continuity will be maintained across thick SiOx.)  He FPA has had several detector changes and the risk of losing the entire FPA by hanging this detector is approximately 502. If the FPA were lost to the rogram would be in excess of \$500000.00 and the delivery schedule would be set ack a months.*  REAL PROPERTY OF WAITS ASSURGED TO STATE THE PROPERTY MANAGEMENT AND ASSURANCE TO STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STATE THE STA	2777E- UN		<del></del> +			•		•				
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#### SPACE AND COMMUNICATIONS GROUP FAILURE REPORT

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SECTION 2.7 RADIATIVE COOLER

Section 2.7.1

Radiative Cooler

Performance Data

Radiative cooler performance data is included in Appendix F (Vol. IV, Part F)

2.7.2 Acceptance Data

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2.7.2.1 Configuration Lists



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#### Program Instruction 010

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1. GRIGINATOR N	ESTOOM OWN ENCE	S Terry C	ifferty	,			2.	DEVIA	TICES		X MAI VER
SBRC, 75	Coronar I	r., Goletz	-				3. 💢	ыкер		เลขาดิเล	CRITICAL.
4.		FOR OEVIATI		R	5. BASE LINE	AFFECTED			6. 01	HEY SYST	ES/COMFIGU.
. MODEL TYPE	b. MFR. CD06	E. 572. 03		SY/ELIVER CO.	Carrier .	العده.		PROS.	RA.	•	MS AFFECTED
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e. SYSTEM		<del></del>									
b. 1789	3 3 3 3	16166				<del></del>					
e. TEST PLAN   11323   16188   SEV B   10. CONTRACT NO. 6 LINE IT											
Permission to shorten temperature control tests											200
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Radiative		1			NA.	NA.		141 1623		MAJOS	CRITICAL
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Radiative			5120	Մ- Շ. 	INCA.	_	1	YES			X reo
	not appro				8 Hou						•
22. EFFEL! ON (			NYTHE ACE.	efe.	0 120	, 3 	اساليست				
None											
23. DESCRIPTION											_
Long term	a stabilit	y tests ar	e abec	ified for	the pri	ruenta Ce	PA te	ncer	atu	ue cox	rtrol
system at	90, 95,	and 105K.	The n	ednitensi	it is $\pm 0$ .	IK over	ant	וכתו	ır po	erica	at
each set	coint. No	temperatu	re cha	uda ra q	recentry.	le in th	2 COI	itto.	Laid	oce vo	
readings	at 95K, a	ind only 0.	04K ch	ange ra d	poserved	row the	TODE	( 521		it.	It is
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		the outg									
the min	rmam eru	e necess	ary to	demons	strate	outigas	sys.	cem	run	GETO	nairty.
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noise and	offset a	nomalies o	bserve	d in seve	eral char	mells of	Baro	is S	and	7 du	ring
thermal/v	acuum tes	iting of th	e radia	ative $\infty$	oler.						
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om IA	REA W. Balinski SIS EVER Hand FE #1/ China										
	25. PRODUCTION EFFECTIVITY SY SERIAL MANGER										
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	1. PROGRAM NAME AT	O NUMBER	2 GLA		FLIGHT	9'00 AM		MB 27 YR 82
	& HARDWARE LEVEL WHEN FAILURE WAS OBSERVED	SPACECRAFT SYSTEM	SUBSYSTEM UNIT		SSEMBLY UBASSEMBLY	MOOULE	CARD	~ 27 02
	EQUIPMENT IDENTIFICA	rion:	NAME		PART NUMBE	A S/N		SUFACTURER
	7. SUBSYSTEM							
	& UNIT				5/200	00	2 5/	BRC
œ	9. ASSEMBLY	SUBASSEMELY						
RIGINATOR	10. CO MODULE CO M	CAM BY CARD			5094	2 00	3 5%	3126
8	11. OTHER							
8	12. TEST WHEN FAILURE WAS OBSERVED	DEVELOPMENT IN-PROCESS	C QUAURCATION MACCEPTANCE			I LAUNCH OPERATIO I	ONS	
	13. ENVIRONMENT WHEN FAILURE WAS OBSERVED	AMBIENT BAC/RA	☐ RADIATION ☐ VIBRATION	AXIS		CAN JAMESHT. B	HRS AT	<b></b>
	OF FAILURE	old Sta	se outgo	s tem	porkin	contr	Mer con	oble
I	to achi	zu a 26	C sety	soist	temp, c	while y	callestin	9 6
ı	Simulate	d syxte		vocas		· ·		
	15. TEST PROCEDURE	16188	PARA	17.00	Lile Stee	ORG 22. 3	1 4/27/8	2 SHEET USED
z	18. VERIFICATION AND FAILURE ANALYSIS	No failur	e - PRT tem	. contro	l sensor ac	hieved 200	Set noint	hur
5	CFPA diode v	ras steady-	state at -3		to steady-s			
ŝi			ified by ana			- TITERAS	- Barrensen	
					19. FAILED ITEM HAM	n None	·····	· · · · · · · · · · · · · · · · · · ·
	20. 🔲 FOLLOWING REV	VORK/RETEST REQUIRE	o use No failur				<del></del>	
	AL REWORK/RETES	T NOT REQUIRED BECA	MR NO LATTAL	e, norma	u operation	^	· <del></del>	
						<del>, , , , , , , , , , , , , , , , , , , </del>		
ENGINEENING			21. AU	THORIZATION	<del></del>	ORG	GATE	ZZ. CONTINUATIO
4	AEWORK/ASTEST					<u> </u>		24. QA REWORK
5	ACTION TAKEN	None	····				··	<b>-</b>  -
1681					<del> </del>		·····	25. QA RETEST
	<del></del>							-
٥Į	28. UST ALL PARTS RE	PLACED	1	· · · · · · · · · · · · · · · · · · ·	T	<del>1</del>		
	PART NUMBER	CKT SYM	PART LOT NUMBER	DATE CODE	MANUFACTURES	PROSA	ABLE DEFECT	emun Bieylana
					ļ	1		
4502	<del></del>				ļ			
⋖∟	Z7. REWORK BY		ORG DATE	154.8	ETESTED BY	ORG	DATE	29. CONTINUATIO
			l bank			100		CONTINUATIO
	30. CAUSE AND CORRECTIVE ACTION	Test Engi	neer believe	d temp.	gradient sh	uld he les	s than meas	ured
Ò			temp. gradie				uation Shee	et)
							33. FRB CLOSUR	ie //
								\(\sigma^*\)
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ENGINEERING/RELIABILITY	١							61.92
				· · · · · · · · · · · · · · · · · · ·		31. CONTINUATION		1/611
	2. DOCUMENT IMPLEM CORRECTIVE ACTION	ENTING			<del></del>	<u> </u>		717
ŀ	M. BASIC CAUSE	DESIGN	TEST EQUIPME	NT UMF	G. PROCEDURE	WIRING ERROR	UNKHOWN	DEFFCT COLLE
	OF VERIFIED FAILURE	C DEFECTIVE PARTS		NT   MF		ROUGH HANDLING		
۱	S FAILURE	I PRIMARY	UNKNOWN O PAILURE		38. FAILURE CLASSIFICATION	CRITICAL MAJOR	☐ MINOR	
╡	ACSPONSIBLE AND	TEER OF	OAG 22-31 0A	E-29-82	30. SPACELRET	EM ENGINEEN	22-4	11.5/5/2
t	S. ASO GILLTY	80:	ORG V/ OA	1 70-0-	क. एएड्रिजेझेड्रा स्माइरि	PPLIE	<del></del> -	DAJE
لــ	S SC JAN BO	hand-	<u> </u>	-30 8L	7/1/A-			1
1187								

#### HUGHES

#### SPACE AND COMMUNICATIONS GROUP

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CONTINUATION EMEET LE TERP

HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP

311873A JAN 80

## FAILURE REPORT CONTINUATION SHEET

€1	L SEGUNDO, CA	ALIFORNIA OUTSISSOMINUS OSIGEI	
		DEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO OR	ADJITICNAL FR
		ries by referencing fr block number in column, date each entry.	CONTINUATION SHEETIS) USED
30		al analysis of the Cold Stage Heater and the Cold Stage E	ladiator
	was per	formed. The results are as follows:	
	1,	Heater and Seusor show the following heating dynamics:	
	<u> </u>	Time zero - Temperature of Cold Stage was - C/	56.2°C
	1 .	(start)	
		5700 seconds later - Temperature of Cold Stage was -20.3	3°c.
	2.	Cold Stage Radiator shows the following heating dynamics	
		Time zero - Temperature of Cold Stage Radiator was - 156	5.5°C
		8700 seconds later - Temperature of Cold Stage Radiator	was -4.9°C
	Note:	Cold Focal Plane is Heat-Sink to the Cold Stage Radiator the same temperature as the radiator.	and is essentially
			0
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SECTION 2.8
RADIATIVE COOLER DOOR ASSEMBLY

## 2.8.1 Radiative Cooler Door Assembly

No performance data was taken at the subsystem lavel on this 2.8.1.1 subsystem.

2.3.2 Acceptance Data

2.8.2.1 Configuration Lists

Configuration listing for the Radiative Cooler Door is included in Section 2.7, Radiative Cooler

Listing of Liens

#### RADIATIVE COOLER DOOR ASSEMBLY

P/N 51740

#### FLIGHT

railure	Reports Number
Open	Closed
	- 58143 58145
58149	S8150

Deviation	Waivers
	W-15G

## RADIATIVE COOLER DOOR ASSY. P/N 51740

FLIGHT Failure Report No.		Failu	OTOFLIGHT re Report No.	ENGINEER Failure Report No.		
Open S8149	Closed S8143 S8145	0pen	Closed F1.741 F2694	Open	Closed F0507 F0512	
	S8150		F2766 F5177		F0517 F0518 F0523 F0528 F0594 F2753 S8098	

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_	EL SEGUNDO. CA	IPONNIA						
1	1. PROGRAM NAME AN	1/62	2. GLA		FUCHT 003	4. TIME OBSERVED	MO 6 DA	7 YR 82
	6. HARDWARE LEVEL   WHEN FAILURE WAS OBSERVED		SUBSYSTEM		SSEMBLY C	MODULE	CARD PART	
1	EQUIPMENT IDENTIFICAT		PMAN		PART NUMBER	S/N	<del>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</del>	ACTURER
	7. SUBSYSTEM							
	& UNIT							
<b>E</b>	9. ASSEMBLY	Zubassenbly	DOC- ASSY	COOLER	51740	003	581	ac_
12	10. ANDOULE AN	AM CARD		7. —				+
2	II. OTHER							
ORIGINATO	FAILURE WAS OBSERVED	DEVELOPMENT	QUALIFICATION ACCEPTANCE		TEGRATION C	LAUNCH OPERATIONS		
	13. ENVIRONMENT WHEN FAILURE. WAS OBSERVED	E EMCIRFI	C RADIATION	Z TE		THERMAL VAC.	HAS AT	-'
	14. DESCRIPTION	CITCAS	POSIT	10N	PANNOT	BE A	つりしらから	?7
	TO ME	ET PA	29 3. Z. A	. 4	SPEC 18	1/2 32	VC.	
		19						
L	15. TEST PROCEDURE	省12	17, Z	.44 18 081	SINATOR PASCOME	3 ORG	6/9/82	17. CONTINUATION SHEET USED
22	18. VERIFICATION AND FAILURE ANALYSIS							
EVALUATION								···
3						·		
2					19. FAILED ITEM NAME AND PART NUMBER		<u> </u>	
ENG.	20. SE FULLOWING REN			10. 534	33 Sh+ 2	70m 4D/1	Reduc	e sucitab
EERIN	override +	ine dura	tion at UI	3-5 Fr	om "1.5 560	ca to "A	PPROX O.	ESEC 4
20	Cachially	ama out	0.65 SEC)	, See	EO 4457	A. Now do	rordnesn'	topen too
2	far nast ou	has soci	d Casi hama	THORIZATION	urrent	2.2-17	6/11/82	Z. CONTINUATION  SHEET USED
-	TRE PAST OF 23. REVOORK/RETEST ACTION TAKEN						·	24. QA REWORK
TEST	Changed	R58	Grans 1.2	M to	470K			
AND		· .						ZE. CA RETEST
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15	908661-1	CKT SYM	PART LOT NUMBER	DATE CODE	MARUFACTURER	N/A	DEFECT	
UFACT	908661-1	CKT SYM	PART LOT NUMBER	DATE CODE	MARUFACTURER	PROBABLE N/A	DE#ECT	
BANUFACTURIN	908661-13	CKT SYM				N/A		REDMUM SIEVAMA
MANUFACT	D. KENNESS BERN	7	PART LOT NUMSER  ORG DATE  22- 73 6//		MARUFACTURER  ERISTED BY	N/A	DATE //2/ 2 2	AMALYSIS NUMBER  3. CONTINUATION  SHEET USED
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	D. CAUSE AND	17	ORG CATE 72- 73 6//	5/82 <sup>2</sup> 2 СиА-	FESTED BY	N/A  ORG 13  Decal 7	DATE/12/22	AMALYSIS NUMBER  2. CONTINUATION  SHEET USED
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SBRC ENGINEER	RING ORDER / REVISION SHEET 1 OF 1	<b>MENOTES</b>	NO. <u>445</u>	
MOTOR DRIVE, COOLE		5093	3 (D)	
PROJECT NUMBER	REWORK THEMS CONFORM	CLASS CHANGE	DRAWING TYPE	
JERNO 003 & SUBQ	NO ITEMS MADE   REJECT   USE   NOT APPLICABLE	TM 2737/02		
DESCRIPTION OF CHANGE	20NE 4 E			
CHANGED VAL	UE RSB			
15: 470K	WAS: 1.2 M			
2) CHANGED SW	ITCH OVERRIDE			
15: APPROX	.5 SEC WAS: 1.5 S	SEC		

JPRINCE 82-6-10 MILLIAM LANGER STATE 182-	** NOTE AND	/OR ITEM	NUMBER TO DE ASE	Diguedisata Tuas Thie Corpòi	TATION.
7 Barket 10 mes Land DO MOTHUSE THIS PRINT	PREPARED BY				GATE   82-0
REA/RSA APPROVAL OAR PROJECT APPROVAL BATTY THE VENTION FOR MING REVERTIFIED	TEAN SIL		7 - 1	DATE INCORPORATED BY NOT USE THIS PRINT	DATE
	RBA/RSA APPROVAL	6/11/8-	The Hinds	PATH THE PENELTH THE REVEST	- ka

### HUGHES

# SPACE AND COMMUNICATIONS GROUP

HUSHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP
TO REQUEST, CAUCOSIA

FAILURE REPORT

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	el eegund), califoraia			•		
Г	1. PROGRAM NAK., AND NUMBER	1/c  2 GLA	1 MODEL	4. TIME COSERVED	S. DATE COSSERVED	1 0 3
	THEMATIC MAPPER	HS 22-A		1100	MO 7 DA	1 YR82
	6. HARDWARE LEVEL SPACECRAFT WHEN PAILURE SYSTEM	SUBSYSTEM		MODULE MICAM	CARD PART	
'	EQUIPMENT IDENTIFICATION:	NAME	PART HUMBER	S/N	MANUPA	CTURER
	7. SUBSYSTEM					
	& unit				1 2 1	<del>~4,~~~~</del>
	9. PASSEMOLY O SUSASSEMOLY	RC DOOR ASSY	1 51740-	1 003		
٥	10. D MODULE D MICAM D CARD					
Z.	11. OTHER					
200	12 TEST WHEN DEVELOPMENT	OUALIFICATION	C) INTEGRATION · C	LAUNCH OPERATIONS	L	
0	OBZENVED LINEAMOCENZ	ACCEPTANCE	SYSTEM Q	1 STR	F014	·
J	TA ENVIRONMENT AMBIENT WHEN FAILURE DESCRIPE	C RADIATION	AXIS FOR TEN TY	PLEGALVAC	HRS AT	·—
	14. DESCRIPTION	SHC SCREW , WA	_		<del></del>	A
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ATH	DUE TO INSUFFICIENT	DROVE BEFORE	VIERATION OR	an theffe	cave loge	SING-
⊃.	DEVICE ON THE SCR	בעם				,
EVAL			19. FAILED ITEM NAME RESMUN TRAC CITA			
92	20 SOLLOWING REWORK/RETEST REQU		1.00s			
ERE	C C C		LIBRATION TEST			est d
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engin	ASSY AND HOTE LOOSE	ITEMS. SFOT BOND	HEADS TO PREVE	WE ROTATI		2. CONTINUATE
<u> </u>	21 REWORK/RETEST	76/1/30	Cooke	!! !!		Caser used
3	ACTION TAKEN STR FOLL	4 COMPLETED.	AYR 51740 SUF	PP 9 COMPU	*T.D	A CA REWORK
TES	FASTENERS RETORQUE	D AND SPOTEON	20. SEE E.O.	4528 A	THIS ED	<b>ر</b> ه •
8	ADA SPOTBOND TO	PREVENT LOOSENU	R16.			23. QA RETEST
40						•
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ᅱ	30. CAUSE AND CORRECTIVE ACTION	7 1 11655	ECTIVE WE		= SCLEL	
	CORRECTIVE ACTION QUISA	A BY INEFF	ECTIVE WE	100		73
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	CONSECTED B				1	
_	TO PLOVENT	LOWSENING	JASHEAR 1	2000	· ·	
RUTY	TO PERVENT	CONSENIUS .:	CEZN 70 C	4.295		A
IABILITY	TO PROJENT CHANGED FROM PATTERN TO IN	CONSENIUS SMALL PAT CREARE RIG	(JASHEDZ LA TEZNI TO L LDITY.	A.EGF	14 20	ANA
RELIABILITY	TO PERVENT CHANGED FLOM PATTERN TO IN	LODENING : SMALL PAT CREARE RIG	TRIN TO	A. ELL	March	182
10/RELIABILITY	TO PROVINT CHANGED FROM PATTERN TO IN	LOUSENING :	CONTACTED A	31. CONSTINUATION SHEET USED	Affect 120	m  gr
₹	TO PLOVINT  CHANGOD FLOW  PATTERN TO IM  DOCUMENT IMPLEMENTING  CORRECTIVE ACTION	LOUSENING IN SMALL PAT ICREASE RIG	CASHER LA TECH TO L COPTACHED THETHERED COPTACHED COPTACHED COPTACHED	A.E.C.	1/20	/82
≊	TO PERVISATE  CHANSON FLORI  PATTERN TO IN  DOCUMENT IMPLEMENTING CORRECTIVE ACTION  31. BASIC CAUSE   5 DESIGN	CREASE RIG	CTIVITY 3/ O	O3 \$ SUBSON	UNXNOWN I	JPV DREETT CODE
GINEERIN	DOCUMENT IMPLEMENTING CORRECTIVE ACTION  BASIC CAUSE OF VERIFIED FAILURE OFFECTIVE PAR OFFECTIVE PAR	TEST PROCEDURE	CTIVITY SO MFG. PROCEDURE O ASSY/FAB ERROR O WORKMANSHIP	O3 \$ SUBSO O3 \$ SUBSO ROBREIDBRIENW DRUGHAHINEDUOR TUCHRAW		JPV DREECT CODE
ጅ	DOCUMENT IMPLEMENTING CORRECTIVE ACTION  2. BASIC CAUSE OF VERIFIED FAILURE DEFECTIVE PAR  23. FAILURE DEFECTIVE PAR  24. FAILURE DEFECTIVE PAR  25. FAILURE DEFECTIVE PAR  26. FAILURE DEFECTIVE PAR  27. FAILURE DEFECTIVE PAR  28. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  20. FAILURE DEFECTIVE PAR  20. FAILURE DEFECTIVE PAR  20. FAILURE DEFECTIVE PAR  20. FAILURE DEFECTIVE PAR  21. FAILURE DEFECTIVE PAR  22. FAILURE DEFECTIVE PAR  23. FAILURE DEFECTIVE PAR  24. FAILURE DEFECTIVE PAR  25. FAILURE DEFECTIVE PAR  26. FAILURE DEFECTIVE PAR  26. FAILURE DEFECTIVE PAR  27. FAILURE DEFECTIVE PAR  28. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE DEFECTIVE PAR  29. FAILURE	L TEST PROCEDURE	MFG. PROCEDURE	O3 \$ SUBSO O3 \$ SUBSO O3 \$ SUBSO ORDERAL HANDING WEARHOUT	UHXNOWN I	PV DEFECT CODE
GINEERIN	DOCUMENT IMPLEMENTING CORRECTIVE ACTION  31. BASIC CAUSE OF VERIFIED FAILURE FORMARY  22. FAILURE FORMARY	TEST PROCEDURE TS TEST SET-UP UNKNOWN NO FAILURE ORG	MFG. PROCEDURE  ASSYPAB ERROR  WORKMANSHIP  32. FAILURE  CLASSIFICATION  BL-GFACTERST-VESTIC	O3 \$ SUBSO WARING TERROR WEARHOUT O CRITICAL	MINOR SAFETY ORG	JBV DEFECT CODE
GINEE	DOCUMENT IMPLEMENTING CORRECTIVE ACTION  3. BASIC CAUSE OF VERIFIED OF VERIFIED OF ENVIRONMENTA  FAILURE DEPRETIVE PAR  25. FAILURE DEPRETIVE PAR  TYPE   INCLUED	L TEST PROCEDURE TS TEST SET-UP UNKNOWN NO FAILURE ORG DATE	MFG. PROCEDURE  ASSY/FAB ERROR  WORKMANSHIP  20. FAILURE CLASSIFICATION	SHEET USED  O 3 # SUZSO  WIRING TERROR ROUGH! HANDLING WEARHOUT  CRIETICAL  MALJOR MENGINEER  **MENGINEER**	MAINOR SAFETY	

[SBRC] E	NGINEER	ING CHA	ange R	REQUEST NO.TH	2749/01
PRAWING TITLE RADIAT		r door	assy	S1740	E
CLASS CHANGE DEAWING	<b>F</b> .	TY OF CHANGE	C restant	1162 2011	
OTHER APPECTED ENGINEERS					
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		ORIGINA OF POC	IL PAGE 13 IR QUALITY		
	L.L	2 for FRPLII	<b>, 7-</b> 9-82		
FINCH ER	CATE APPRE	A Janes A	DATE 7/8/82	AETTIW 122NE YSSUGAED BA	
& Vera aras	79-82 () NO03	DVAL CC	7/9/32 DATE 7/8/82	ACTION TAREN  E.O. 4528A DWG. R  INCORP BY   DATE	EV
REWORK   ITEMS CONF	ORM DEFO	Monsell Della	7/8/82 7/8/82	M. Jinike 7 Jul 82 William 82 Barre 82 Will Brush 82	MRS REQ

[SBRC] ENGINEER	RING ORDER AREVISIO	A HOUCE	NO. <u>4528A</u>	
RADIATIVE COOLER DO	or assy	51740-E		
PROJECT NUMBER	HEWERK   ITEMS CONFORM	CASS CHANGE	D A D	
18 SUBSA	NO ITEMS MADE (S) REJECT () USE () HOT APPLICABLE ()	AUTHORIZING ECE NI TM 274	2	
i) LM, ADDED ITE	M X   MS15795-804   Washer, 1	SLAT (.IZS NORD	11 * 101	
Z) LM, QTY REQD				
ITEM 73	S: 17 6Z WAS : 23 C	sc sc		
3) ADDED NOTE	3			

THREADED ITEM TO PREVENT ROTATION PER SP 80060-I-A-Z.

\*\* NOTE AND/OR ITEM NUMBER TO BE ASSIGNED AT TIME OF INCORPORATION.

PREPARED BY

FINCHER

7 JULB2 DATE

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[SBRC] ENGINEERING ORDER AREVISION HOUSE NO.
PRADIATIVE COOLER DOOR ASSY S1790
DESCRIPTION OF CHANGE
4) SHZ, ZN D7, ADDED CALLOUT
15 (17-5) WAS (17-5)
AREAD (65) ORIGINAL PAGE IS 4READ (5) OF POOR QUALITY  FZ
5) SHZ, ZN D7, ADDED CALLOUT
IS B-S
B REOD (69)  8 REOD (71)  15  15  18  18  18  18  18  18  18  18
6) SHZ, ZN B7, ADDED CALLOUT
15 9PL (71) WAS 9PL (71) W2
7) SHZ, ZNB7, ADDED CALLOUT
15 GPL (71) WAS GPL (71)

015-1A (3-73)

[SBRC] ENGINEERING ORDER / REPOSION INCOMES	NO. <u>4528 A</u>
LEAWING TITLE RADIATIVE COOLER DOOR ASSY 51740	•
B) SH Z, ZN AS, ADDED CALLOUT	
4REQD (I) SORIGINAL PAGE IS AREQD (GZ) OF POOR QUALITY  1 S	
9) SHZ, ZN D4, ADDED CALLOUT	
15 (15)-5 WAS (15)-5  4REQD (5) (71) (72)	
10) SHZ, ZN D5, ADDED CALLOUT	
15 (-49)(53) WAS (-49)(5) (62) (70) Z REQD (75)	3) 2 REQD

SBRC ENGINEERING ORDER REVISION NO. 4528 A
DEAVING TITLE RADIATIVE COOLER DOOR ASSY 51740
DESCRIPTION OF CHANGE  11) SH Z, ZN DS, ADDED CALLOUT
11) IN Z, EN US, HOUSE CALLOUT
! IS S-ED WAS S-ED
(59) 3 REQD (73) 3 REQD
(13)) (*2)
ORIGINAL PAGE IS
12) SH 3, ZN D7, ADDED CALLOUT OF POOR QUALITY
15 (G)-5 WAS (G)-5
15 4PL (3)
(FZ)
13) SH 3, ZN A7, ADDED CALLOUT
15 18 WAS 183-5
2P. (70) ZP. (70)
(75) [*2]
14) SH 3, ZN BG, ADDED CALLOUT
(73) $3PL$ $(73)$ $3PL$

NG. 933-1A

[SBRC] ENGINEERING ORDER /- REVISION SHEET 5	NENOTICE NO.4528A
PRAWING TITLE RADIATIVE COOLER DOOR ASSY	S1740
15) SH 3, ZN BS, ADDED CALLOUR	ORIGINAL PAGE IS OF POOR QUALITY
*2	(10)—S (Expr) (66)
16) SH3, ZN AS, ADDED CALLOUT	
26-5 WAS  Z REQD (7)  *2  *2  *2  *2  *2  *2  *2  *2  *2  *	22)—5 539) 71)
17) SH3, ZN A4, ADDED CALLOUT	
15 5-25 WAS (67) 2 REQD	5-25) 67) Z REQD
18) SH3, ZN BZ, ADDED CALLOUF	
15 5-16 WAS 5-16 (6) 3 REQD (66	

1980C POSM NO. 088-1A (3-73)

SBRC]	NGINEERING	ORDER / REN		HEE NO.
	TIVE COOLER DE	oor assy	DEAMING . 51	•
DESCRIPTION OF CHANG		DED CALL OUR	- CHAICED	04
	, ZN EG, ADI			
IS IS	(*1)}2PL	WAS	5—59) 73) z	PL
	ZN E7, ADDE	D CALLOUT	•	
<u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	<del>35)-5</del>	WAS	<u>33</u> -5	
6 ÆQD	**************************************	C REQ	33-5 D { (37) (71)	
Z1) SH 4)	ZN D7, ADI	DED CALLO	UT	
19 PL		AS 19PL	(B)—5 (B) (B)	

	58150
SBRC ENGINEERING ORDER / REAL SHEET 7	HSION NOTICE NO. 4528 A
DRAWING TITLE RADIATIVE COOLER DOOR ASSY	BRAWING NUMBER 51740
22) SH 4, ZN A6, ADDED CALLOU	T, CHANGED CALLOUT
23) SH S ZN E3, ADDED CALLOUT	
IS S-B) Z REOD WAS	STOREGO
24) SHS, ZN DT, ADDED CALLOUT	
9 PL (60) (73) WAS	9 PL (B)

SEC PORM MO. 058-14 (2-73)

RADIATION TITLE RADIATION	ie cooler do	or Assy	S1740	
25) SH 5, 8	N C7, ADD	D CALLOUT		
15	<u>[</u> 4]—5	WAS	(14)—5	
3 REQT	(4) (4) (4) (4) (4) (4) (4) (4) (4) (4)	3 RE	14)—S 500 (61) 73	
to the				•
26) SH5,	ZN B7, AC	ded Call		•
IŞ.	$\bigcirc$	WAS	<u>O</u> -5	٠
- 4 Requ	(Q) (Tb)	4 REQ		•
27) SU 5 :	EN B4, ADDE	ED CALLOUT		
, , , , ,				٠.
2 REQD	(29)—	WAS Z REQD		
2 8500	( <del>59</del> )	Z REQD	) (27)	

SERC ENGINEERING ORDER REVISION NOTICE NO.4528 A
DEAMING TITLE RADIATIVE COOLER POOR ASSY 51740
28) SH5, ZN B3, ADDED CALLOUT
2 8EQD (57)  2 REQD (57)
Z REQD (57) (88)  ORIGINAL PAGE IS OF POOR QUALITY
29) SH 5, ZN C3, ADDED CALLOUT
15 (52)49-5 WAS (52)49-5 Z REQD (58) Z REQD (58) Z REQD (70)
Z REQD (58)  Z REQD (58)  (70)
30) SH5, ZN CZ, ADDED CALLOUP
15 3PL (94) WAS 3PL (94)-5

JEC /DEM NO. 055-14 (3-73)

[SBRC] ENGINEERING ORDER AREVISIO	N NOTICE NO. 452
DEAWING TITLE RADIATIVE COOLER DOOR ASSY	SI740
31) SHG, ZN AS, ADDED CALLOUT	
15 5-39 WAS  (2) AREAD  ORIGINAL OF P	(2) 4 PEQD (71) 4 PEQD INAL PAGE IS OOR QUALITY
32) SHL, ZN B3, ADDED CALLOUT	
15 5-60 GD WAS 5	(2) 6 PL
33) SH6, ZN TO3, ADDED CALLOUT	
S S PL WAS S	-(A) 71)} 9 PL

SBRO ENGINEERING ORDER AREVISA	ON-NOTICE NO. 4528A
DRAWING TITLE RADIATIVE COOLER DOOR ASSY	S1740
34) SH6 / ZN F3, ADDED CALLOUT	ORIGINAL PAGE IS OF POOR QUALITY
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35) SHG, ZN CI, ADDED CALLOUT, CH	ANGED CALLOUT
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36) SH 7, ZN FG, ADDED CALLOUT	•
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37) SH7, ZN C4, ADDED CALLOUT	
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388C FORM NO. 033-14 (3-73)

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	51740-1			KIT NEW PART PER			Q.A. INSPECT KIT			REPLACE WASHERS.	4528A,SIX PLACES	AND SHEET 6, ZONE	16357, REV B			Q.A. INSPECT ABOVE	
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SECTION 1.9
TOP OFFICAL ASSEMBLY

#### 2.9.1 Top Optical Assembly

#### 2.9.1.1

No performance data was taken at the subsystem level on this subsystem.

2.9.2 Acceptance Data

2.9.2.1 Configuration Lists

AS-BUILT CONFIGURATION LIST

OPTICAL ASSEMBLY 52532 S/N 003

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FART 110.	52532				TP-32015-501	TP-32015-503	TP-32015-504	TP-32015-608
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Listing of Liens

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# TOP OPTICAL ASSEMBLY P/N 52532

## FLIGHT

Failure R	eports Numbers
Open	Closed
	F1764 S8361 S8405

Deviations	Waivers
D-154 D-156	W-145

## TOP OPTICAL ASSY.

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## P/N 52532

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# SANTA BARBARA RESEARCH CENTER A Subsidiary of Hughes Aircraft Company INTERNAL MEMORANDUM

TO: G.S. Pleus

CC: Distribution

DATE: 820527

REF: HS236-8004

FROM: J.C. Campbell

SUBJECT: ACO7 Optional Test Configuration-

Bands 1-5, 7 Testing

BLDG: B11 MAIL STA.

78

EXT: 6151

REFERENCE: HS236-7989 IA04 Configuration Options

#### INTRODUCTION:

This memo describes a possible optional test configuration. TM to BTCE, that can be used for Bands 1-3, 7 testing during the ACO7 test phase to support the presently defined ACO7 data collection and also to provide the TM instrument with computer controlled power turn on and thermal shutdown capability. This configuration is based on reference memo HS236-7989 and is presented here in terms of existing configuration drawings and test procedures to the extent possible.

#### TEST CONFIGURATION

 Configure TM & BTCE per drawing 3533100-300-2, but with the following possible exceptions:

:	FUNCTION :							- <del> </del>
•	X-Y ALIGN MONTR:		!	3-19	:	W-10		
+	VIDED MONITOR :	DUN'T CARE	1	E-3	:	W21	4-2	
į.	HDRR :	DON'T CARE	:	F-10	ŀ	(see	DWG)	1
:	DEMUX :	DON'T CARE	;	G-7	;	(see	DMG)	1
1	TM MUX TST PTS :	NOT USED	:	G-15	11	ERIFY	DISCONN.	. ;
;	:		;		: 1	15002&	W5003	. ;

2. Then refer to phase-I DWG 3533100-300-1, and make the following connections or changes:

	FUNCTION :	REQUIREMENT	:	DWG ZONE	! CABLE or CONN# !
1	B1 AOTS VIDEO	CONNECT		E/F-17	I WTC30& 35
1	B2 AOTS VIDEO !	CONNECT	1	E/F-17	1 WTC31& 36 1
	B3 AOTS VIDEO !	CONNECT	1	E/F-17	: WTC32& 37 :
1	B4 AOTS VIDEO :	CONNECT		E/F-17	1 FEC33% 38 1
1	B5 AOTS VIDEO !	CONNECT	1	E/F-17	i WTC-41 :
Ì	B7 ADIS VIDED 1	CONNECT	1	E/F-17	; WTC-42 ;
1	ADTS DC RESTR	1 CONNECTION	:	E/F-15	1 W3050 to J410 !
	AUTS TLMY	NOT USED	ı	E/G-15	1W5050(J162, J105, 1
1			:	: .	: & J400) :
1	AOTS VID OUT	CONNECT	i	F-15/17	1 9033% W5036 1
1	AOTS IN COUNT !	DON'T CARE	;	G-16	LAOTS CONN B5-J5 !
1	DC RESTORE	CONNECT	1	E-19	: W-139 !
9					r \$========= !

- Provide the following functions according to test procedure number TP32015-514:
  - a) Install the SMACC per Appendix U: connect SMACC or SAMLOCK Drawer to penetration-plate connector P-10 via adapter cable # W3071. Ground the SMACC dc power return to the Collimator Ground Bus.
  - b) Implement "Shutter Aside" via Appendix S. Method 3 at TM connector P45.
- 4. Install the BTC and CFPA Temp Sensor Converter per Appendix V of TP32015-504.
- 5. Bring TMT software up using TLMY stream #2.

TM COMMANDS REGUIRED:

Power the following TM functions ON:

#### TM-COMMANDS (ALL BANDS)

TM: 001; PS1 ON

IM: 004: Thermal Shutdown Enabled

TM: 009; SHE 1 ON / 2 OFF

TM: 005: MUX ON (PS1)

TM:007; TLMY Scaling ON

The choice of this configuration is optional and is to be used at the Test Director's discretion. If its use fails to support the test adequately then the configuration shall be per phase - I DWG 3533100-300-1 as originally specified by TP32015-514.

Program Instruction 010 REQUEST FOR DEVIATION/VALVER SATE PREPARED *3-25-*82 DRIGINATOR NAME AND ADDRESS OGVI ATTOM RBV 148 Y Santa Barbara Research Center To an week [ KOION CRITICAL 75 Coromar Drive, Goleta, CA 93117 1. BASE LINE MICCIED DESIGNATION FOR DEVIATION/VAIVER STHER 11323 X mo FLIGHT TM W145 . GRADINGS AFFECTED SPECIFICATIONS AFFECTED TEST PLAN MFR. CODE \$790.700C. NO. ₩78. COOK 52048 GEV. KO2. KD. SYSTEM I TOS TP32015-501 TO. CONTRACT TO. & LINE ITEM Waiver from IAOLR test procedure NAS-5 2400 TT. SERVICEMATION TYPE YOURSELECTIONS SERECT SLABELVICATION 12. CS NO. Cotical Assembly MINION MONOR ☐ CRITICAL MECHERING SEVIATION/EAIVEN 52532 - D X Optical Assembly N/A YES TO. THEREY SH ESSY/PHICK T. BYKEY Sh SELTVEN None ECTO! IN. CONTENT ON THRESHALD CONTENTS EMPIREM. INTERPACE. TIC. None 23. DESCRIPTION IF SEVIATION YELVER Dalete the Fine Focus (post-shimming) Test of Band 1, in Paragraph 5.5 of TP 32015-501(G) test procedure, for flight model only. IL. HELD FOR SEVIATION SAIVER 1. Test equipment problem with collecting Band 1 video data. 2. Sufficient MIT focus data has been obtained from visco collects of Bands 2,3 & 4. 3. To preclude schedule delay in starting next systems test, IAO6R. SYS ENGR PRODUCTION SPREETIVITY BY SERIAL SOLESEE 51065 SN CO3 ONLY Minor - System Engineering Program Manager APPROVAL, DISAPPROVAL PASSANT 1ECOPOEDIOSO DISAPPROVED 2/20/02 NASA GSFC DD . 22.1694

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## Hughes

HUGHES AIRCRAFT COMPAN

# SPACE AND COMMUNICATION GROUP FAILURE REPORT

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## SPACE AND COMMUNICATIONS GROUP

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SECTION 2.10 TELESCOPE ASSEMBLY

2.10.1 Telescope Assembly

2.10.1.1
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2.10.2 Acceptance Data

2.10.2.1 Configuration Lists

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P/N 51337, S/N 002, FLIGHT

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E.J. Vergara Configuration/Data Management

R.L. Dick Quality Assurance

Listing of Liens

#### TELESCOPE ASSEMBLY

P/N 51337

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Program Instruction 010

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# MATERIAL REVIEW CONTROL ORDER 2

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22-74	60	TOUCH UP CHROMATE					
		CONVERSION COST (ALOONE)					
•		ALUM TELESCOPE MOUNTALE					
		RING PER NOTE 11 OF					
		DOANING 50842 REVG.					
	<del></del>	AFQA AND SBRO					
51-41	70	Q.A. INSPECT ABOVE OPR.	.				
		AND PERFORM TAPE TEST ON PRINT ACROSS ALWINED AREAS.					
22-74	80	REMOVE No ARGE					
		INSTACLED IN OPR 10.					
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LAST		RETURN THIS CARD TO MATERIAL REVIEW FOR RECORD CLEARANCE.					
CPR		RECORD CLEARANCE.					

SB 0344-B-1 FEB 78

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SPACE AND COMMUNICATION GROUP FAILURE REPORT

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#### SANTA BARBARA RESLARCII CENTER 4 Subsidiary of Hughes Augisti Campany

#### INTERNAL MEMORANDUM

TO: J. Engel

cc: L. Candell R. Thousen

9 February 1982 DATE:

IIS236-7831 REF:

2221-506

ORIGINAL PAGE IS SUBJECT: Summary of MTF Performance OF POOR QUALITY for FMI Talescope

J. E. Young FROM:

MAIL STA. 78 BLIX.

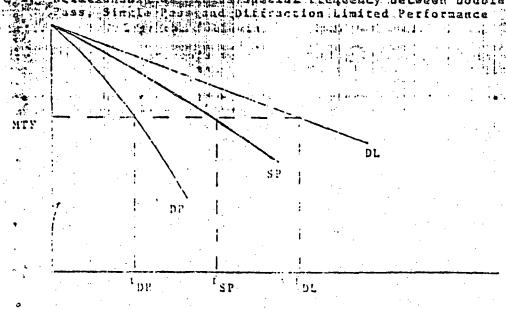
EXT.

#### Introduction

During the measurement of TM flight model (FMI) telescope E7L/MTF performance it was noted that its MTF was lower than the TM Protoflight (PFM). The MTF values for the spatial frequency of 11,750 cycles/radian were 0.86 (subsequently revised to 0.88) and 0.94 for FMI and PFM, respectively. Failure report, F0552 was initiated. Additional MTF measurements were then completed using special test request, STR #71-002. The purpose of the additional measurements and associated analyses were to assess whether TM FMI sensor would pass the square wave response (SWR) of  $\geq$  0.35 @ 11,750 cycles/radian in the final thermal vacuum (T/V) performance tests.

#### Discussion

The measurement of MTF at the telescope level is accomplished in a double pass node, see TP 32015-612 for a detailed description. The measured MTF in double pass must be converted to single pass MTF. Figure I, conceptually fillustrates the relationship between MTFDP 



Spatial Frequency

4552

J. Engel

-2-

9 February 1982 #S236-7831 2221-506

Summary of MTF Performance for FM1 Telescope

The expression used to calculate  $f_{\mathrm{SP}}^{-1}$  is

the water and the control of the first

$$f_{SP} = \left( \left( 2 \, \epsilon \, \epsilon_{DP}^{-2} - \epsilon_{DL}^{-2} \right)^{-3/2} \right) - \epsilon_{1} \cdot \epsilon_{DL}^{-1} \right)^{-3/2} \tag{1}$$

where  $f_{\mathrm{DP}}$  is a measured parameter and  $f_{\mathrm{DL}}$  is approximated by

$$f_{\rm DL} = 310.50 (1 - MTF)$$
 for MTY > 0.60 (2)

and spacial frequency is in units of kilocycles per radian.

Table Tales a tabulation of therigh vs MTF. Equation (1) was used to convert double pass to single pass values except for the MTF listed for a spatial frequency of 11.75 K cycles/radian. These values were obtained by linear interpolation, from adjacent points. The tabulated data includes Y (along scan) and X (cross scan) axes. Peripheral data is given, such as: time, Z axis location, and field angle. The last column notes the telescope configuration, principally, the telescope/mainframe interface bolt torque status.

It should be noted that FM-1 telescope optical system has appreciable astignatism, even though the data tabulated in Table I shows very little. This is due to the astignatism axis being about 30 degrees to the Taxis.

The TM PFM data has been used in an attempt to extrapolate whether the TM FM-1 performance will pass the specification of SWR  $\geq 0.15$  @ 11.75 K dycles/radian. In an attempt to gain confidence in our extrapolation methodology the following PFM data was used.

In January 1981 PFM measurements were made during IAO1 and IAO2 in an attempt to understand the "measured low MTF values". The results of the associated analyses will be listed and their composite values compared with measured system level PFM MTF performance. All values are for a spatial frequency of 11.75 K cycles/radian.

Table 1. IM Flight Model (FM-1) Computed Single Pass Function of Spatial Frequency vs MTF. F552

			Y55/
	YAxis	X Axis	
ORIGINAL PAGE IS OF POOR QUALITY	SP K Cycles MTF Bad	fgP i K Cycles MTF Rad	Comments
TP32015-612 25 Jan 82 ***********************************	11.28 0.889 11.75 0.831 13.23 0.822 23.05 0.641 29.46 0.564	11.73   0.882 11.75   0.874 15.29   0.806 21.13   0.650 29.55   0.523	Telescope/Nainframe interface bolts torqued
On Axis  TP32015-612 26 Jan 82 05:10:01 (Y Axis) 06:30:52 (& Axis) Z = 0.0000 inch	39.36   0.383   11.15   0.902   11.75   0.893   15.11   0.843   22.91   0.719   29.32   0.614	39.61 0.357 11.34 0.881 11.75 0.873 15.29 0.807 21.12 0.651 29.54 0.524	Telescope/Hainframe interface bolts: torqued
On Axis  TP32015-612 26 Jan 32 22:58:09 (Y Axis) 22:58:09 (X Axis) Z = -0.010 inch On Axis	11.23 0.895 11.75 0.887 15.12 0.831 22.98 0.701 29.38 0.594 39.27 0.425	39.42 0.351 11.15 0.902 11.75 0.893 15.13 0.840 22.98 0.701 29.41 0.586 39.28 0.420	Telescope/Mainframe interface bolts torqued
TP32015-012 27 Jan 82 01:30:16 (Y Axis) 01:30:16 (X Axis) 2 = -0.010 On Axis	11.12   0.905 11.75   0.895 15.12   0.341 23.01   0.694 29.45   0.571 39.33   0.397	11.17   0.900 11.75   0.890 15.16   0.834 23.03   0.688 29.46   0.567 19.35   0.388	Telescope/Mainfraze interface bolts torqued
STR # F1-002 30 Jan 82 18:51:39 (Y Axis) 18:51:39 (X Axis) Z = 0.003 On Axis	10.99 0.914 11.75 0.904 14.96 0.861 22.76 0.749 29.16 0.655 19.03 0.504	10.95   0.916 11.750   0.905 14.95   0.862 22.81   0.741 29.24   0.635 39.11   0.481	Telescope/Mainframe interface bolts "loose"
STR # F1-J02 31 Jan S2 00:45:11 (Y Axis) 00:45:11 (X Axis) 2 = 0 005 inch On Axis	11.21 0.897 11.75 0.889 15.15 0.236 22.96 0.708 29.37 0.599 39.25 0.431	39.47 0.321	1/3 deg CCW as viewe from behind primary mirror Telescope/ Mainframe interface
STR # F1 10 10 10 10 10 10 10 10 10 10 10 10 10		1- 10.84 0.922 11.75 0.911 14.33 0.673	Telescope rotated = 1/3 CW back to ori- ginal position Telescope/Mainframe interface bolts torqu
STR # F1-002 1 Feb 82 14:24:47 (Y Amis) -4:24:47 (X Amis) Z =-0.010 On Amis	10.84 0.922 11.75 0.910 14.85 0.871 22.75 0.757 20.15 0.657 39 5 0.497		that only 10 bolts

Table (. TM Flight Model (FM-1) Computed Single Pass function of Spatial Frequency vs MTF - continued.

				•	
	Y Axi	3	X Ax	15	
ORIGINAL PAGE IS OF POOR QUALITY	f <sub>SP</sub> K dvelen Rad	MTF	igp Koveles Rad	MT F	Comments
STR # F1-J02 1 Feb 82	10.53 11.75	0.934 0.921	19.99	0.914	10 boles loosene
16:45:58 (Y-AXIS) 16:45:58 (X-AXIS) Z = -0.005	14.51 22.29 28.54	0.393 0.806 0.742	14.97 22.30 29.17	0.860	
On Axis	38.11	ა.650	38.94	0.524	81 pt. KEA
STR # F1-001 2 Feb 32 10:51:35 (Y Axis)	11.13 11.75 15.09	0.904 0.895 0.845	11.05 11.75 15.05	0.910 0.900 0.850	Telescope/Mainframincerface bolts retorqued
10:51:15 (N'Axis)  2 = -0.005 inch  On Axis	29.36 39.27	0:715 0:600 0:423	22.93 29.36 39.23	0.715 0.601 0.438	KER 41 pts
STR # F1-002 2 Feb 82	11.10	0.906	11.26	0.891 0.882	Telescope/Mainfra interface bolts
15:34:26 (Y Axis) 15:34:20 (X Axis) 2 = -0.004 inch	15.06 22.87 23.19	0.849	15.23 23.07 29.49	0.821 0.672 0.552	
2 = -0.304 inch STR # F1-002 2 Feb 82	39.19 11.10 11.75	0.453	11.09 11.75	0.390 0.907 0.897	
17:08:50 (Y Amis) 17:08:50 (X Amis) Z = -0.010 inch	15.06 22.89 29.12	0.349	15.07 22.91 29.33	0.848	torqued KER - 81 pts
+4 ar.Field Angle STR 0 F1-002	11.31	0.835	39.22 11.36	0.878	
2 Feb 32 - 13:14:55 (T Axis) - 1	11.75	0.317	11.75	0.870	interface bolts torqued
18:14:55 (X Axis)   2 = -0.010 inch   -4 mr.Field Angle	23.05 29.44 39.28	0.600	23.16 29.58 39.44	0.635 0.505 0.338	

Spatial Frequency vs MTF - continued.

F552

ODIOINAL DAGE IO	Y Axi	s	. x.l. Y	s	
ORIGINAL PAGE IS	t sp		r sp		
OF POOR QUALITY	K Cycles	MTF	K dygles	MTF	Comments
4	Rad	· ·	Rad		
STR # F1-002	13.53	0.934	10.99	0.914	10 bolts loosened
1 Feb 82	11.75	0.921	11.75	0.904	:
16:45:58 (X Axis)	14.51	0.393	14.07	0.860	
16:45:58 (X Axis)	22.29	0.806	22.30	0.743	
z = -0.005	28.54	0.742	29.17	0.651	
On Axis	j∴.11	υ.65U	38.94	0.524	81 pt. KER
STR # F1-002	11.13	0.904	11.05	0.910	Telescope/Mainframe
2 Feb 32	11.75	0.895	11.75	0.900	interface bolts
10:51:35 (Y Axis)	15.09	0.845	15.05	0.850	retorqued
10:51:35 (X Axfs)	22.93	0.715	22.93	0.715	
Z = -0.005 inch	29.36	0.600	29.36	0.601	KER 41 pts
On Axis	30.27	0.423	30.23	0.438	& & & & & & & & & & & & & & & & & & &
STR # F1-002	11.10	0.906	11.26	0.891	Telescope/Mainframe
2 Feb 32	11.75	0.897	11.75	0.882	interface bolts
15:34:26 (Y ARIB)	15.06	0.349	15.23	0.821	torqued
15:34:20 (X Axis)	22.87	0.728	23.07	0.672	
Z = -0.004 inch	23.19	0.621	29.49	0.552	
2 = -0.304 inch	39.19	0.453	39.35	0.390	6x = 6y = 0.001 inch
STR # F1-002	11.10	0.906	11.09	0.907	
2 Feb 32		0.897	11.75	0.897	
17:08:50 (Y Amis)	15.06	0.849	15.07	0.848	
17:08:50 (X Amis)	22.89	0.724	22.91	0.719	•1:
Z = -Q'.Oldrinch	29.32	0.613	29.33	0.610	NER - 81 pes
+4 pr.Fleld Angle			39.22	0.445	6X = 6Y = 0:0001 inc
STR. # 81-00	111311			0.878	Telescope/Mainframe
2 Feb 32 ***********************************	11. 715		11.75	0.870	interface bolts
18:14:55 ( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	15.25	0.817	1	0.801	torqued
. 18:14:55 (N-Axis)	23.05	0.600		0.635	1
20.010 inch m	29'. 44	0.574	29.58	0.505	KER 31 pts
-4 mr.Field Angle	1 39.28	9.421	39.44	0.338	6X = 6Y = 0.0001 inc

6552

Table II. Protoflight Model (PFM) MTF Components 9 11.75 K Cycles/

2	ζοπροπα:: t	MTF	Location of Referenced Da Technical Journal
1	Telascope	0.34	ти кккі (кі588) рд.
2	Ad3 Induced Degradation	0.94 to 0.89	TM XXX1 (K1588) pg. 10.
3	SMA	0.90 to 0.8%	TM XXX1 (K158d) pg. 99
4	Electrical Filtering	0.70	ORIGINAL PAGE IS
5	IGFOV	0.63	OF POOR QUALITY

The total MTF is obtained by

$$MTF_{+} = MTF_{1} \times MTF_{2} \times MTF_{3} \times MTF_{4} \times MTF_{5}$$
 (3)

and an approximation for SWR is given by

$$SWR_{\pi} = (4/1) MTF_{\pi}$$
 (4)

Table III is a tabulation of the results.

Table III. Composite MTF and Extrapolated SWR

named a sec	HTY <sub>T</sub>	SWR <sub>T</sub>	
Minimum Value	F 0.325	0.413	
Maximum Value	0.15	AND 447 minesti	:,

Table 19 18 3 tobulation of FM SWR measured in T/V tests during September 1931. A more complete set of values is given in HS236-7680

"Table IV. PFM T/V SWR Measured Performanced

and the second second	SWR (1	5 September	1931)
	Chan		
3and	High.	1.09	Average
1	0.471	0.434	0.456
2	0.463	0.410	0.438
,3	0.432	0.389	0.407
4	0.455	0.398	0.433
5	0.439	0.394	0.416
;	0.447	0,404	0.435

The correlation between predicted SWR (Table IER) and measured SWR (Table IV) is better than I had expected due to the approximation methods used to obtain the predicted values. Mevertheless, it gives a degree of credence to the analytical approximations used.

F552

Using some of the same approximation methods the FM-1 system performance is predicted by

(5)

or a property to be a

where

 $0.88 \le MTF_{mq}$  (telescope)  $\le 0.90$ 

using the smaller value of 0.38. Table V is generated.

Table V. Predicted FM1 System Level SWR Performance Based Upon FM1 and PFM Telescope MTF Differences and PFM (September 1981)

Sand	Predicted F: (0.83/0.94)	
1.171.5	11:3510.427	3 4 8 9
1 - 1 - 2 - 1	0.410	
1	0.381	
4	0.405	
l 5	0.389	•
1 7	-0.407	

#### Data Location

Test information is located in TM System Test Log Book Fl. Data was recorded on history tape per Table VI.

Table VI. History Tapes - Recorded Data

Time (1982)	History Tape #
1/25	n 03000
1/26-1/27	n n 2002
1/29-2/1	p 03003
2/1 -2/2	0 03004
2/2 -2/3	5 03005

Additional information on the test is available in HS236-7837, 2221-508. TM F1 EFL/MTF Test Report.

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9 February 1982 IIS236-7831 2221-506

of MTF Performance for FML Telescope

#### Conclusion

As seen above the FMI predicted SWR System performance meets the TM specification of SWR 2 0.35 at 11,750 cycles/radian with margin. It has been noted that our analytical methods are not exact. Rowever, there was good correlation between predicted values and actual measured PFM SWR (September 1931) performance. As an aside there, is no question of the adequacy of FM1 cross scan (X axis) SUR performance. Since there is no appreciable electrical filtering component in this direction, the system cross scan SWR should be > 0.50.

Thus it is recommended that failure report F0552 be closed based upon the data and conclusions presented above.

# HUGHES

## SPACE AND COMMUNICATION GROUP FAILURE REPORT

F 0591

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	CHANGED TO IMPOSE INSPECTION OF PARTS AND WITNESS SAMPLES							
	PRIDE TO COATING FOR CONTAINMATION 2) FUE SOSAS MILETO							
-	CHANGED HUMIDITY PEQUIREMENTS FROM 24 HOURS AT 50°C AWITH							
1	95% RELATIVE HUMIOITY TO; 24 Hours AT FROM 45 TO 50°C WITH							
1	SO TO 95% RELATINE HUMICITY.							
ING/A	IZ CONTINUATION  IZ DOCUMENT IMPLEMENTING (D							
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E NG	JA. BASIC CAUSÉ OF VERIFIED FAILURE  PAILURE  DEFECTIVE PARTS	1817 PROC.		SEY/FAS ERROR CORKMANAMP	ROUGH H	MOLING F	DEFECT CODE	
	38. PAILURE PRIMARY UNION	OWN		LURE	CRITICAL	(20) MINS		
	17. RESPONSIBLE ORG. 2	DATE .	JR SPACE	CRAFT .	Douga	100000 T	6110L	9
1	IR RELIABILITY ORG	1-x1 = 10-19-	P 40 CUSTO		a sage	C 166	CATE	<u>-</u>
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### HUGHES

# SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

POS91 CONT. SHEET POS91 LETTER\*

IUGHE:	AIRCRAFT COMPANY	FR SERI	AL NO.
	*Label First Continuation sheet used 'a', second 'b', and so on		ADDITIONAL
	IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.		SHEETIS) US
30	Witness samples failed when tested to drawing 50825 Rev. C. Rev. C	of dra	wing 5082
	required the witness samples to be tested at 50°C and 95% relative	humidi	ty. There
	were no tolerances for temperature or humidity specified on Rev. C	of draw	ving 50825
	Therefore, the witness samples were tested above design limits. Wi	tness :	samples fr
	the same lot were tested to Rev. D of drawing 50825 and passed.		
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# HUGHES AIRCHAFT COMPANY

# SPACE AND COMMUNICATION GROUP FAILURE REPORT

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1742

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		& HARDWARE LEVEL   MINEN FAILURE   WAS OCCURRED	SYSTEM	5 SUEST	VETEM	SUGASSEN		MODULE MICAM		CARD	
		EQUIPMENT ICENTIFICATION:		NAM!		NONESEN	PART H		\$/N		UACTUER
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		15. TEST PROCEDURE	1	RA 16.ORIGIN	ATOR A	Danie		OAG	DATE ///	140	CONTINUATION SHEET USED
. [		PAILURE ANALYSIS NOTE:	FR was	written in	error and	part wa	s sent	to MRB f	or disp	sition	r.
		Refer to NCMR 28	0985. (0	Copy attached	d).						
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	7			<del></del>		18 PAILED ITEM P	YAM?				
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- 1	941	20 UST ALL PARTS REPLACED		<del></del>							<del> </del>
-	5	PART NUM CER	CRT SYM	PART LOT NO.	DATE CODE	WFR	<del> </del>	PROBABLE DEFEC	<del>-</del>	AMAL	YSIS MO.
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		27. REMODRIC BY	OA!	G CATE	28. RETEST	(D		ORG.	DATE		CONTINUATION SHEET USED
		30 CAUSE AND CORRECTIVE NO I		ject FR was				anomaly o			
		have been written on a Failure Report, instead it should have been recorded on a Non-									
- 1	Ì	Conforming Material Report (NCMR) and submitted for Material Review   11. FRECLOSURE									
- [	ı			been correct					<b>∵</b>		
- 1	2										. #
-1	1	280985 and submission of subject hardware for Material Review Action.  This Failure Report is cancelled as of 10/29/81. Note: Part was									
	1	This ratiole Report is cancelled as of 10, 10, 10, 10, 10, 10, 10, 10, 10, 10,									
-	ş	dispositioned "use as is" by Material Review (2) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUATION (3) CONTINUA									
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-	Ì	17 RESPONSIBLE		ORG - DATE	10-29-81	JB. SPACECRAFT SYSTEM ENGR	117	mark	ر دروم	6/ DAIL	319030
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### HUGHES

#### SPACE AND COMMUNICATION GROUP EQUIPMENT CHECKOUT FAILURE REPORT CONTINUATION SHEET

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> F1742 CONT. SHI FR SERIAL NO. |

	*LABEL FIRST CONTINUATION SHEET USED 'A', SECOND 'B', AND SO ON	ADDITIONAL CONTINUATION SHEET(S) USE
_	IDENTIFY ENTRIES BY REFERENCING FR BLOCK NUMBER IN COLUMN, DATE EACH ENTRY.	3/1EE (13) 03E
30	Board authority. A copy of NCMR 280985 is attached.	
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#### HUGHES

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#### SPACE AND COMMUNICATIONS GROUP

FAILURE REPORT

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$\Gamma$	1. PROURAM NAME AND NUMBER	1 GLA	1. MODEL	4. TIME OBSERVED	5 DATE COSERVED				
}			FL	23:40	MO // DA & YR &				
	6. HAROWARE LEVEL SPACECRAFT			MODULE	CAND .				
	WAS OBSERVED   SYSTEM	UNIT S	UGASSEMBLY (	] MICAM	PART				
1	EQUIPMENT IDENTIFICATION: 7. SUBSYSTEM	S/N	MANUFACTURER						
	TELESCOPE AS	<u>rY</u>	5/337	A 002	SORC				
	B. UNIT PRIMARY MIRES	ac.	5082Z	00/					
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13	11. OTHER	<del> </del>	ļ						
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18		· · · · · · · · · · · · · · · · · · ·	19. FAILED ITEM NAME	50000					
		<del></del>	AND PART NUMBER	50877	***************************************				
Ä	REWORK/RETEST NOT REQUIRED BECAUSE								
2	Removed & paral	דא דיידו מיצו	MRCO 29	9608 AN	O WAINER W-095				
ENGINEERING		4-4-3	1.105.5						
12		21. AURHORIZATION	111	ORG	DATE 22 CONTINUAT				
La:	1	1 Com	f.h	52-32	//-/3-3/ C SHEET USE				
	23. REWORK/RETEST ACTION TAXEN			*	A OA REWOR				
TEST	SEE ATTACH	ED MRC0 2996	18 Aug 5	1070 HS 23					
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MANUFACTURING	PAR NUMBER CKT SYM P	PART LOT NUMBER DATE CODE	MARUFACTURER	PROBAGLE	DEFECT ANALYSIS NU				
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A	27. REWORK BY CR	IG DATE 28LR	ETESTED BY	CRG	DATE 29. CONTINUA				
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1	CAUSE AND CORRECT	TIVE ACTION NC	MR # 29	950B	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				
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ENGINEERING/RELIABILITY	CORRECTIVE ACTION NCMR	299608 (ATTACHED	<u> </u>	/	1/2 11/11				
	34. BASIC CAUSE   DESIGN	. A TEST EQUIPMENT C ME		RORRS DAIRIN	UNKNOWN DEFECT CODE				
15	34. BASIC CAUSE   DESIGN OF VERIFIED   ENVIRONMENTAL FAILURE   DEFECTIVE PARTS		FG. PROCEDURE SSY/FAB ERROR CORKMANSHIP	ROUGH HANDLING WEAR-OUT					
2	35. FAILURE   PRIMARY	UHKNOWN	38. FAILURE	CRITICAL	MINOR				
	TYPE INDUCED  THE ASSOCIATE ANGINERA	ORG DATE	BASSIFICATION BY SPACECRAFT SYST	MAJOR	ORG CATE				
		22.35 11-18-61	7/16/19	m. 1.5000	122-4) 11/19/8;				
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